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ANNUAL REPORT TO PRESIDENT
REVIEWING 1986
SEATTLE CEMENT PLANT
January 26, 1986 7

PREPARED BY: Kenneth J. Rone, Jr.

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ANNUAL REPORT TO PRESIDENT
REVIEWING 1986
SEATTLE CEMENT PLANT

Production for the year 1986 was significantly below plan, due to a cement terminalling agreement reached with Ideal Basic Industries (IBI) in mid-year, resulting in large tonnages delivered to Ash Grove's Seattle inventory for distribution to existing Ash Grove customers. This new supply and a stable market share, resulted in much reduced in-plant production. Excess capacity from the Durkee kiln continued to be shipped to the plant at the expense of purchased tonnage of clinker from Tilbury Cement Ltd., (TCL). Bulk and sack cement were supplied to traditional markets, as well as the Kennewick and Lake Oswego terminals with the following noteworthy developments:

- IBI switched their bulk masonry purchases to Ash Grove product for their resale, replacing more costly product produced at their Montana Plant.
- Ground blast furnace slag blended with cement was produced and sold in significant quantity to Asamera Minerals.
- The closure of the Lake Oswego Terminal resulted in the opportunity for the Seattle Plant to supply sacked cement to Western Oregon.
- An agreement to warehouse "Atlas" brand white cement in sacks was struck with Lehigh for whom we already distributed bulk white cement.

* * *

CLINKER

The supply of clinker from TCL was reduced to 64% of anticipated levels due to the IBI cement exchange. The TCL clinker quality remained marginally competitive and suffered from low strength gain, poor steam and fly ash response and high free lime.

Type I clinker from the Durkee Plant was shipped to Seattle and ground for both Type I and Type III markets, out-performing the TCL product in both cases. All Type III cement production was converted to the Durkee source. To properly match the Durkee capacity, only specific customers were offered Type I cement produced with Durkee clinker.

TABLE I

CLINKER INVENTORY

Beginning Inventory	18,249
TCL Type I Received	37,909
TCL Type II Received	90,103
Durkee Type I Received	53,742
Ending Inventory	20,688

128,012

* * *

BLAST FURNACE SLAG

Early in the year, the grinding of a trial quantity of granulated blast furnace slag was undertaken. The material was received on November 7, 1985, and held in two clinker silos until March 1, 1986, to avoid winter energy penalties. Testing during January gave assurance that silo withdrawal would be without problems.

In March, one silo was found to be very prone to bridging and withdrawal was quite slow, but was accomplished with extra manpower. The other silo proved to be completely consolidated and explosive experts were commissioned to successfully blast the material loose.

Grinding the product to 560 B.S.S. proceeded relatively uneventfully. 4595 tons were thus produced into inventory. There has been little interest in this product over the year.

* * *

FINISH MILL OPERATION

The finish mill operation was again maintained throughout the year primarily by salaried supervisors with backup assistance from the shift bulkloaders and day shift production personnel. Type II and Type III cements were produced routinely in quantities approximating customer demand. Two separate Type I cements were produced; designated Type I-G (100% TCL Type I clinker) and Type I-D (100% Durkee Type I clinker). These were shipped to designated customers and inventoried appropriately.

2085 tons of masonry cement were produced. In order to secure the required fugitive dust emission credits which would be required to offset those generated by a newly constructed plant, the raw material storage, crushing, raw mill and clinkering equipment was warranted to be permanently shut down. With the resulting inability to crush limerock for masonry production, rock was purchased for this product.

The administered preventative maintenance program was continued, resulting in no major failures. An extensive departmental overhaul finished the year highlighted by the reversal of #1 mill, extensive alterations to #1 separator, tightening the product's partical size distribution, modifying the mill ventilation to reduce dust collector catch, #1 mill motor overhaul and calbration of the power distribution protective systems.

Rates for electrical energy increased 14.3% in May, reduced by intensive lobbying by industrial users from the 30% increase proposed. Plant personnel participated in the public hearings which preceeded this rate increase. Time of day rates also went into effect beginning in November.

TABLE II

FINISH MILL OPERATING DATA

	Type I-G	Type I-D	Type II	Type III	Masonry	Slag	Total
Tonnage	54,108	26,944	94,984	15.764	2,085	4,304	198,189
Tons/Hour	51.9	50.2	51.2	28.3	28.7	13.3	45.1
Tons Gypsum	2,910	1,480	5,093	1,139	65	108	10,795
Blaine, M^2/Kg	387	384	386	564	768	560	417
Hours Operated	1,042	537	1,856	557	72.7	324	4,389
Tons Grinding Aid	8.4	4.2	14.6	5.0	0.2	1.6	32.7

* * *

SHIPPING

Sack cement represented 5.6% of our shipped tonnage. This is an increase of 60.1% over last year due to the closure of the Lake Oswego sacking facilities and the introduction of Seattle product into the Oregon market through the Rivergate Terminal.

Near year end, IBI began purchasing their masonry cement requirements in bulk from our inventory. This replaces the costly shipment from their plant in Montana of this product which the IBI Seattle Plant does not produce.

The only sale of ground blast furnace slag was for a mine shaft backfill application requiring a 70% slag, 30% cement blend. The customer had no capability to bend. An electronic sequencing system was developed to alternate silo withdrawal, at pre-selected intervals, to a common cement pump which resulted in an acceptable blend of cement and slag. This alternating mixture was conveyed to a shipping silo where airation assured a homogenous blend. Blend ratios were checked by product reflectance against known standards. Chemical and physical checks were also performed.

In May, shipments of Ideal cement were received to balance the deliveries of Durkee cement to IBI's Vancouver, Washington Terminal, as part of the cement exchange and terminalling agreement made with IBI. Type I and Type I/II, manufactured by IBI, were blown off through newly added convey lines into separate silos. Demand for I/II often exceeded IBI's ability to supply and on two occasions our inventory of I/II was depleted, resulting in our need to send the customer directly to IBI.

An agreement was made with Lehigh Portland Cement Co., to terminal their "Atlas Brand" white cement in sacks similarly to the service we provide them for bulk "Atlas" cement. Ash Grove's marketing efforts promote "Atlas" brand as well, which is shipped in sacks from a separate inventory purchased from Lehigh by Ash Grove.

TABLE III
SHIPPING

TONS	BULK	SACK	TOTAL	MANHOURS
Type I-G	64,434	-	64,434	-
Type I-D	26,809	-	26,809	-
Type I-IBI	10,963	-	10,963	-
Type II	80,717	12,276	92,993	-
Type II-IBI	35,226	-	35,226	-
Type III	18,260	1,361	19,621	-
Masonry	906	2,670	3,576	-
Oil Well	408	-	408	-
White	-	94	94	-
GRAND TOTAL	237,723	16,401	254,124	17,098

* * *

MAINTENANCE

Plant mechanical maintenance continues to be performed by two skilled millwrights with the active assistance of the Repair Supervisor. Electrical maintenance continues to be performed by the Electrical Supervisor. Mobile equipment maintenance is contracted.

* * *

ORGANIZATION/PERSONNEL

The position of Plant Engineer was eliminated. The involvement of the Plant Engineer was much better utilized by project assignments at other locations (Blubber Bay, Lake Oswego). The position of Storekeeper was eliminated by the promotion of Mr. Carrington to Plant Office Supervisor, (b) (6) [redacted] (b) (6) [redacted]

Two college students were hired during the summer as vacation relief. One hourly employee was terminated for misconduct and replaced by one of the summer students, who decided not to return to school. One new employee was hired into the Building and Grounds B position to replace an employee who resigned to pursue the boat building profession.

In June, our involvement with the Clinker Club was terminated, and the club taken over by Lonestar Industries. It is our understanding that Lonestar continued the services of the housekeeper who had been employed by us as an independent contractor.

Plant security (two shift/day and all day on weekend and holidays) is performed by a professional security firm. Similarly, janitorial services are contracted.

* * *

SAFETY

Accidents referred to physicians	6
Lost time accidents	-0-
Safety Committee Meetings and Tours	14
MSHA Inspections	2
Plant wide safety gatherings (movies, lectures)	18

In November, Safety Committee member and Electrical Supervisor, Mr. Gabel, attended the Governor's Safety Conference sponsored by the Washington State Department of Labor and Industries.

The plant completed 110,000 manhours without a lost time accident as of year end. The safety incentive program called "Safety Bingo" continues to command active interest. In October, in recognition of two years without a lost time accident, all employees were awarded a $45 gift certificate to a local department store.

On March 25th and September 16, 1986, a MSHA representative toured plant facilities as required semi-annually. Two citations were issued during the former visit and several recommendations to correct areas of concern. The latter visit was without citations or recommendations.

* * *

CAPITAL/ENGINEERING

Projects Completed in 1986

Hammerhead crane removal
Baghouse installation at clinker rail car unloading
Underground tank removal and surface tank substitution
#2 Symetro input shaft seal replacement
#1 Finish mill reversal
Tower 9 baghouse replacement

Projects Completed in 1986 (Continued)

Clinker shed enclosure
Blubber Bay chemical circuit
Settling pond dredging
PCB transformer removal, clean up and containment
Truck blow off lines to cement storage silos
Superior Quarry developmental drilling
Blast furnace slag blending system
Dall Island annual assessment drilling
70' x 15' portable float to catch conveyor belt debris

Projects continuing into 1987

Permitting - Superior Quarry
Plant roof restorations
Stockpile removal and plant regrade
Petroleum coke rehandling

* * *

ENVIRONMENTAL AND LEGISLATIVE MATTERS

A compliance inspection was performed at the plant by the Puget Sound Air Pollution Control Agency (PSAPCA) during which no citations or recommendations were presented. As previously mentioned, PSAPCA was petitioned to allow banking of fugitive emissions eliminated by the partial plant shutdown in 1984, as well as emissions eliminated by the capital improvements installed in 1986. 223 tons per year of fugitive emissions were thus banked.

The Washington State Department of Ecology responded to an inspection made in 1985 by requiring a concrete pad with runoff containment be constructed under our coal stockpile. This request was mitigated by the removal of the stockpile from the plant.

One complaint was received for alleged cement dust deposits on two automobiles. The owners were convinced that the deposits were obviously paint overspray from another source, with which the owners appeared satisfied.

There are few activities or situations which indicate any risk to the plants ability to operate in the future. The participation of plant personnel in the following public processes will be sufficient to assure the plant's interests are protected:

1. Shoreline Management Act, Land Reclassification Study.
2. City of Seattle, Department of Construction and Land Use Comprehensive Re-zoning Study.
3. State of Washington, Notice of Plant Closing Legislation.
4. Seattle City Light, 1988 Electrical Rate Restructuring.
5. EPA/METRO Duwamish River Characterization and Clean-Up Programs.
6. Port of Seattle/City of Seattle, Lower Duwamish Navigational Improvements.

* * *

MISCELLANEOUS

- 2500 tons of limerock was sold to Seattle Steel Company at $5.00/ton, F.O.B. plant.
- Wharf space was leased to various barge companies requiring moorage for idle barges at $3K/month.
- 3850 tons trial delivery of Superior silica made to TCL.
- Fred S. James & Co. of Oregon assumed workmen's compensation/self-insurance administration in April.

ASH GROVE CEMENT WEST, INC. OPERATIONS REPORT - CEMENT

SEATTLE

December, 1986

	MONTH	YEAR
Clinker production capacity		
Clinker production scheduled		
Clinker produced		
Clinker produced, % of schedule		
Clinker produced, % of optimum		
Clinker purchased	5,522	128,012
KWH per ton of clinker		
Mill B.T.U./ton, kilns only		
Cement production scheduled	14,691	266,759
Cement produced	0	198,189
Cement produced, % of schedule	0%	74%
Cement produced: Type I	0	81,052
Type II	0	94,984
Type III	0	15,764
Type I-P	0	0
Ground Slag	0	4,304
Oil Well, G	0	0
Masonry	0	2,085
Cement shipments estimated	14,691	266,759
Cement shipments actual	19,102	285,862
Cement shipments, % of estimate	130%	107%
Cement Shipments: Type I	7,774	102,996
Type II	9,542	155,345
Type III	1,453	20,319
Type I-P	0	0
Ground Slag	0	3,632
Oil Well, G	96	408
Masonry	237	3,162
Inter-Company shipments received	15,513	84,765
Intra-Company shipments		
Clinker shipped		
Clinker received	5,987	53,742
Cement shipped	267	3,230
Cement received	0	0
Inventories:		
Clinker produced & purchased	20,688	
Cement produced & purchased	24,984	
Coal	0	
Gypsum	4,129	
Ground Slag	968	
Wage MH/ton cement shipped (Load and ship only)	.070	.060
Wage MH/ton clinker produced (exclude load & ship)		
Wage overtime, % of total wage MH	.07%	2.9%
Wage overtime, % of total wage MH (exclude load & ship)	.1%	4.1%
Employment		
Additions, (Discontinuations)		
End of Month Total	25	
End of Month Wage	12	
End of Month Salaried	13	

OPERATIONS REPORT -- COMMERCIAL ROCK

	MONTH	YEAR
Primary Crusher Production		
Commercial rock		
Production		
Sugar rock		
Shipments		
Other than to Plant		
Rock from Blubber Bay		
E.O.M. Inventory		
KWH/Ton Clinker - Quarry		
Prod. to Plant		
Employment		
Additions (Discontinuations)		
End of Month Total		
End of Month Wage		
End of Month Salaried		

Comments regarding production, shipments, personnel, safety, quality, maintenance, plant projects, raw materials, weather, etc.: All Locations

1. One reportable accident - Welding burn. No doctor required.
2. Continued winter overhaul of finish mill.
3. Met with Lynn Nordby, City Administrator in Enumclaw. Introduced him to the Superior Quarry Project. He was supportive of the project. Visited Superior Quarry with lawyer to access environmental impacts. Also visited quarry with Don Merlino and his quarry manager with the interest of submitting a quotation. Weyerhaeuser has refused to participate in any mobilization, site access or hole casing charges from the project. They are still evaluating what portion of the bulldozing charges they are responsible for. Met with King County Councilman, Gary Grant, to introduce to him the plans at the project. He indicated no opposition to the project and felt it had minimal impact on the area.
4. Ideal transfers shut off, at their request, for two days due to clinker shortage. Our inventories are adequate. They indicated they would not accept two carloads of iron bearing material given to them from Lake Oswego clean-up, because of tramp iron contamination. Material will be unloaded at this plant and trucked to Durkee.
5. Final coal delivery shipped to Durkee by truck. Stockpile is now gone and we are finally in compliance with METRO directives issued on 1/30/85.
6. M.V. Million Tradder completed discharging its cargo of cement at Kaiser Terminal after 20 days.
7. Our appeal of the Washington Dept. of Labor & Industries' jurisdiction over the plant safety compliance was heard. A decision is forthcoming.
8. Plant gate picketed by Local 174, Teamsters Union, during the presence, on site, of a Mutual Materials truck. Pickets left after truck was loaded.
9. Very low Type II strengths resulting from production on 11/19 and 11/20. Retest of split sample shows no difference from original sample.
10. No cement production month of December.

KJR:lmb

ANNUAL REPORT
OF
LABORATORY OPERATIONS
ASH GROVE CEMENT WEST, INC.
SEATTLE, WASHINGTON
1986

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OVERVIEW

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A tour of several Southern California's cement plants was made by N. Fernow, Chief Chemist, in conjunction with an EG&G Ortec x-ray analyzer demonstration at Gifford Hill's Riverside, California plant. The plants toured included Cal-Mat; California Portland Cement, Mojave; Gifford Hill; Oro Grande; Southwestern Portland Cement, Victorvill; and Kaiser Cement's Cushenbury plant, Lucerne Valley.

The conclusion of a W.R. Grace HEA 2-GL grinding aid test showed a 6% increase in materials used per ton of cement and the Grace product cost was higher per pound as well. We returned to using Union Carbide CGA #4 for the remainder of the year.

A second test lot of 4,000 of Superior silica was delivered to Genstar (Tilbury) Cement, Ltd. The silica content averaged 92.6% with an alkali content below 0.1% as sodium.

The use of an ultrasonic cleaner for mold cleaning has given us excellent results and given the laboratory technicians needed time for non-routine tests and customer service.

The Portland Cement Association's mill grinding course was attended by N. Fernow, Chief Chemist. Conventional grinding and material sizing techniques, as well as, newer high efficiency crushing and separation equipment were discussed.

Chemical analysis of routine samples were shifted back to Seattle in May due to the closure of the Lake Oswego facilities. Both laboratory technicians have been trained in clasical wet chemical analysis and provide excellent analysis for our cement, clinker, slag and raw materials.

The cements received in Seattle from the Ideal Basic Industries, Ash Grove Cement West exchange was/is monitored for compliance with applicable specifications and overall quality. Complete chemical and physical tests are fun on a composite that represents the weeks delivery. (Data included in Cement Production Analysis Section.)

A blended slag product was made using a sequence timer system designed by D. Gabel, our Chief Electrician. The blend ratio was monitored and adjusted by the lab by using a reflectance meter calibrated for slag/cement blends.

Developmental drilling at the Superior Quarry site, east of Enumclaw, Washington, generated over 300 samples. These samples were dried and repaired for analysis in the Seattle lab, then sent to Durkee for x-ray analysis.

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The current list of products available for shipment from the Seattle Plant include:

Ash Grove Seattle,	Type I
	Type I-D (Bulk Only)
	Type II
	Type III
	Masonry, N
	Ground Blast Furnace Slag (GBFS)
	70% GBFS/Cement Blend
Ash Grove Durkee,	Type II as Oil Well and Type V
Ideal Basic Industries,	Type I (Bulk Only)
	Type I/II (Bulk Only)
Lehigh, Atlas	White

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GENSTAR CLINKER ANALYSIS

SEATTLE - Sample taken during barge unloading at Seattle Plant

TILBURY - Sample taken during barge unloading at Tilbury Plant

TYPE I

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GENSTAR CLINKER BARGE ANALYSIS REPORT

TYPE I

Date	Barge #		SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	SO_3	Loss	Free CaO	Total Na_2O	C_3S	C_3A
4/2	95-86	SEA	21.56	5.42	3.68	65.54	2.57	0.59	0.27	0.78	0.55	61.2	8.1
		TIL	21.8	5.3	3.4	65.7	2.5	0.4	0.08	-	0.48	60	8.2
4/22	121-86	SEA	21.40	5.43	3.97	65.69	2.66	0.43	0.10	1.08	0.52	62	7.7
		TIL	22.0	5.2	3.5	65.8	2.4	0.4	0.3	1.3	0.58	60	8.0
5/21	154-86	SEA	21.22	5.13	3.63	64.31	2.88	0.47	0.19	0.75	0.48	60	7.5
		TIL	21.7	5.0	3.5	65.1	2.5	0.5	0.2	1.3	0.58	62	7.3
6/10	171-86	SEA	21.64	5.13	3.79	65.83	2.29	0.34	0.19	0.36	0.52	64	7.2
		TIL	21.8	5.1	3.5	66.4	2.0	0.4	0.35	0.80	0.60	65	7.7
7/8	199-86	SEA	22.06	5.09	3.79	65.68	2.15	0.55	0.0	0.69	0.52	58	7.1
		TIL	21.6	4.8	3.5	64.7	2.1	0.6	0.1	1.10	0.57	62	6.8
10/21	311-86	SEA	22.44	4.46	3.12	65.89	2.36	0.65	0.17	-	0.51	61	6.6
		TIL	22.4	4.4	2.6	65.3	2.2	0.5	0.3	0.90	0.54	62	7.1
12/16	354-86	SEA	22.08	4.83	3.37	65.75	2.38	0.25	0.11	0.95	0.55	62	7.1
		TIL	22.3	4.8	3.1	66.2	2.2	0.4	0.5	0.88	0.60	63	7.4
		SEA											
		TIL											
1986 Average		SEA	21.77	5.07	3.62	65.53	2.47	0.47	0.15	0.77	0.52	61	7.3
		TIL	21.94	4.94	3.31	65.60	2.27	0.45	0.26	1.04	0.56	62	7.5
1986 Standard Deviation		SEA	0.43	0.34	0.29	0.55	0.25	0.14	0.08	0.24	0.02	2	0.5
		TIL	0.30	0.30	0.35	0.61	0.20	0.08	0.15	0.22	0.04	2	0.5
		SEA											
		TIL											
		SEA											
		TIL											
		SEA											
		TIL											
		SEA											
		TIL											

TYPE II

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GENSTAR CLINKER BARGE ANALYSIS REPORT

TYPE II

Date	Barge #	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	SO_3	Loss	Free CaO	Total Na_2O	C_3S	C_3A
1/21	SEA 17-86	22.42	4.97	3.55	64.64	3.22	0.41	0.30	0.90	0.44	54.2	7.2
	TIL	22.2	4.8	3.3	64.3	3.0	0.5	0.6	1.11	0.50	56	7.2
1/28	SEA 25-86	22.04	5.02	3.64	65.32	3.48	0.39	0.91	1.14	0.45	59.4	7.2
	TIL	22.3	4.5	3.2	64.7	2.9	0.4	0.4	1.3*	0.53	59*	6.6
2/27	SEA 48-86	22.30	4.74	3.66	64.99	3.06	0.55	0.11	0.90	0.46	58.0	6.4
	TIL	22.3	4.8	3.2	64.7	2.8	0.5	0.20	1.30*	0.63*	57	7.2
3/7	SEA 63-86	22.58	4.97	3.43	64.90	3.03	0.48	0.39	0.60	0.50	54	7.4
	TIL	22.6	4.7	3.1	64.8	2.8	0.61	0.4	0.6	0.63*	55	7.0
3/18	SEA 79-86	22.26	4.96	4.14	65.45	2.46	0.39	0.11	0.72	0.51	58	6.1
	TIL	22.7	4.8	3.4	65.6	2.5	0.4	0.4	1.12	0.59	57	7.0
3/27	SEA 91-86	22.00	5.43	3.97	64.95	2.55	0.45	0.24	0.90	0.53	55	7.7
	TIL	22.1	5.1	3.6	64.7	2.3	0.4	0.11	0.80	0.51	55	7.4
4/15	SEA 114-86	22.32	5.10	3.74	65.52	2.52	0.48	0.23	0.90	0.53	57	7.2
	TIL	22.3	5.1	3.6	65.2	2.4	0.5	0.34	1.12	0.53	55	7.4
4/29	SEA 134-86	22.29	4.74	3.74	65.47	2.67	0.36	0.20	—	0.50	59	6.2 ‡
	TIL	22.6	4.9	3.3	65.0	2.6	0.4	0.49	1.07	0.55	55	7.6
5/27	SEA 157-86	22.06	5.19	3.77	65.00	2.73	0.45	0.13	0.59	0.49	55	7.4
	TIL	22.3	5.1	3.7	64.5	2.3	0.4	0.14	0.51	0.57	53	7.3
6/24	SEA 186-86	22.22	4.91	3.69	65.68	2.38	0.53	0.14	0.65	0.48	60*	6.8
	TIL	22.4	5.1	3.6	65.3	2.1	0.4	0.2	0.7	0.58	57	7.3
7/3	SEA 194-86	22.08	5.42	3.52	65.25	2.21	0.35	0.60	0.78	0.51	55	8.4*
	TIL	22.2	4.7	3.5	64.8	2.4	0.5	0.5	0.9	0.57	57	6.6
7/15	SEA 208-86	22.12	5.00	3.76	65.97	2.29	0.24	0.18	0.49	0.49	61*	6.9
	TIL	22.3	5.1	3.6	65.4	2.2	0.4	0.3	1.00	0.57	57	7.3
7/22	SEA 220-86	21.32	5.08	2.08	65.63	2.44	0.60	0.40	0.75	0.44	58	7.0
	TIL	22.1	4.8	3.6	65.0	2.4	0.58	0.28	0.98	0.60	57	6.8
8/6	SEA 223-86	21.76	4.89	3.93	65.40	2.23	0.45	0.40	1.93	0.37	62*	6.3
	TIL	22.3	5.0	3.7	65.0	2.1	0.50	0.29	1.10	0.59	55	7.0

*Does not meet contractural limits for Type II
‡ Durkee X-ray Results

GENSTAR CLINKER BARGE ANALYSIS REPORT

TYPE II

Date	Barge #	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	SO_3	Loss	Free CaO	Total Na_2O	C_3S	C_3A
8/27 SEA	258-86	22.1	5.03	4.05	64.90	2.38	0.44	0.18	0.73	0.55	55	6.5
8/27 TIL		22.2	4.9	3.6	64.7	2.1	0.6	0.25	1.2	0.57	58	6.9
9/29 SEA	286-86	22.50	4.72	3.14	65.75	2.31	0.48	0.27	0.56	0.50	60*	7.2
9/29 TIL		22.7	4.9	2.9	65.8	2.4	0.3	0.2	1.2	0.57	58	8.0
SEA												
TIL												
1986 SEA Average		22.23	5.00	3.71	65.30	2.59	0.44	0.29	0.87	0.48	58	6.9
1986 TIL Average		22.35	4.85	3.41	64.89	2.43	0.47	0.32	1.00	0.57	57	7.1
1986 SEA Standard Deviation		0.45	0.21	0.24	0.36	0.39	0.08	0.20	0.33	0.04	3	0.6
1986 TIL Standard Deviation		0.19	0.26	0.25	0.37	0.30	0.09	0.13	0.23	0.04	2	0.4
SEA												
TIL												
SEA												
TIL												
SEA												
TIL												
SEA												
TIL												
SEA												
TIL												
SEA												
TIL												
SEA												
TIL												
SEA												
TIL												

*Doesn't meet contractual limits for Type II

DURKEE CLINKER ANALYSIS

TYPE I

Composite Samples from Rail Deliveries to Seattle

AGC2D000124

DURKEE CLINKER CAR ANALYSIS REPORT

TYPE I

Date	Sample	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	SO_3	Loss	Free CaO	Total Na_2O	C_3S	C_3A
1/7/86	LO 1-86	22.12	4.83	3.03	66.45	1.89	0.31	0.88	0.96	0.58	65.5	7.6
1/10/86	LO 6-86	22.32	5.11	3.11	66.18	1.90	0.29	0.51	1.32	0.60	60.9	8.3
1/15/86	LO 10-86	23.02	4.97	3.49	65.46	1.89	0.22	0.70	0.60	0.50	53.1	7.3
1/29/86	LO 26-86	22.74	4.84	3.16	66.04	2.00	0.38	0.66	0.66	0.59	58.9	7.5
2/11/86	LO 34-86	22.02	5.06	3.28	66.67	1.77	0.45	0.36	0.36	0.55	65.3	7.9
2/21/86	LO 42-86	22.12	4.73	3.35	66.80	-	0.20	0.36	0.66	0.37	67.2	6.9
3/6/86	LO 55-86	22.38	4.78	3.64	66.93	1.54	0.25	0.30	1.20	0.42	65.0	6.5
3/11/86	LO 64.86	22.94	4.74	3.22	66.71	1.51	0.34	0.31	0.48	0.42	60.7	7.1
3/18/86	LO 78-86	22.00	4.99	3.43	67.34	1.35	0.33	0.19	1.14	0.50	68.4	7.4
3/27/86	LO 90-86	22.80	4.77	3.41	66.62	1.32	0.31	0.33	0.78	0.60	60.9	6.9
4/1/86	LO 96-86	22.96	4.64	3.14	76.43	-	0.27	0.29	0.96	0.48	64.3	7.0
4/8/86	LO 104-86	22.60	4.66	3.28	67.27	1.33	0.29	0.29	0.90	0.50	66.0	6.8
	DK	22.47	4.44	3.22	67.37	1.14	0.47	0.28	-	0.43	67.7	6.3
4/18/86	LO 128-86	22.6	4.57	3.39	66.69	1.51	0.26	0.24	0.66	0.48	64.1	6.4
4/29/86	LO 133-86	22.40	4.61	3.37	67.17	1.27	0.30	0.53	0.78	0.42	67.4	6.5

LO - Lake Oswego Analysis
DK - Durkee Analysis
All Analysis run in Seattle 5/21/86 Sample to Present

AGC2D000125

DURKEE CLINKER CAR ANALYSIS REPORT

TYPE I

Date	Sample	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	SO_3	Loss	Free CaO	Total Na_2O	C_3S	C_3A
5/5/86	DK 140-86	22.54	4.44	3.29	67.35	1.14	0.28	0.29	-	0.53	67.5	6.2
5/21/86	SEA 153-86	22.02	4.67	3.25	65.56	1.50	0.34	0.02	0.59	0.51	62.6	6.9
5/23/86	SEA 156-86	22.22	4.62	3.20	68.06	1.50	0.27	0.07	-	0.47	71.8	6.8
6/4/86	SEA 163-86	22.46	4.54	3.42	67.09	1.38	0.23	0.34	0.43	0.45	66.4	6.3
8/8/86	SEA 237-86	22.34	4.29	3.37	76.40	1.32	0.33	0.23	0.34	0.37	71.0	5.7
8/13/86	SEA 242-86	22.80	4.44	3.62	67.11	1.32	0.27	0.06	0.25	0.49	61.2	5.7
8/19/86	SEA 247-86	22.84	4.47	3.63	66.83	1.38	0.27	0.18	0.35	0.49	62.5	4.7
8/26/86	SEA 255-86	21.88	5.01	3.35	66.54	1.47	0.44	0.33	-	0.64	65.3	7.6
9/4/86	SEA 261-86	22.40	4.63	3.63	66.86	1.21	0.29	0.12	0.28	0.47	65.7	6.1
9/8/86	SEA 266-86	22.46	4.88	3.52	67.00	1.12	0.24	0.21	0.16	0.41	64.2	7.0
9/22/86	SEA 280-86	22.40	4.69	3.51	66.65	1.26	0.25	0.29	0.34	0.45	64.5	6.5
9/29/86	SEA 285-86	23.26	4.73	3.63	66.30	1.11	0.33	0.16	0.11	0.50	56.1	6.4
10/6/36	SEA 293-36	22.92	4.38	3.28	67.97	0.96	0.28	0.41	0.33	0.54	68.4	6.1
10/14/86	SEA 302-86	22.44	4.73	3.51	66.86	1.17	0.27	0.32	-	0.50	64.1	6.6

AGC2D000126

DURKEE CLINKER CAR ANALYSIS REPORT

TYPE I

Date	Sample	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	SO_3	Loss	Free CaO	Total Na_2O	C_3S	C_3A
10/21/86	SEA 310-86	23.10	4.29	3.37	66.37	1.14	0.35	0.34	0.27	0.56	64.1	6.6
11/4/86	SEA 319-86	23.00	4.67	3.56	66.30	1.03	0.34	0.06	-	0.58	57.0	6.2
11/7/86	SEA 321-86	22.87	4.61	3.37	66.37	1.11	0.40	0.38	0.30	0.54	59.8	6.5
12/3/86	SEA 344-86	23.54	4.40	3.40	66.16	0.93	0.21	0.12	0.19	0.55	56.0	5.9
12/12/86	SEA 355-86	22.96	4.71	3.35	66.86	0.91	0.40	0.21	-	0.57	61.3	6.8
12/30/86	SEA 362-86	22.66	4.37	3.45	76.43	1.08	0.39	0.36	0.63	0.62	68.0	5.8
AVERAGE		22.59	4.67	3.38	66.76	1.35	0.31	0.29	0.57	0.51	63.9	6.7
STANDARD DEVIATION		0.39	0.21	0.16	0.58	0.29	0.06	0.18	0.33	0.07	4.4	0.7

AGC2D000127

CEMENT PRODUCTION ANALYSIS

AGC2D000128

TYPE I

Produced from 100% Tilbury Clinker

AGC2D000129

PLANT Seattle CEMENT TYPE I YEAR 1986

	JAN	FEB	MAR	APRIL	MAY	JUNE
CHEMICAL ANALYSIS						
SiO_2	21.53	21.14	21.10	21.19	20.83	20.52
Al_2O_3	4.86	4.54	4.57	4.69	4.80	5.14
Fe_2O_3	2.60	2.78	2.86	3.03	3.21	3.44
CaO	65.62	64.18	64.31	64.96	64.45	63.97
MgO	1.08	2.36	2.52	2.01	2.30	1.97
SO_3	2.55	2.57	2.60	2.44	2.38	2.38
Na_2O	0.17	0.20	0.21	0.22	0.22	0.29
K_2O	0.46	0.40	0.37	0.40	0.31	0.31
Free CaO	1.04	1.02	0.98	0.93	0.76	0.64
Ign. Loss	1.13	1.85	1.34	1.35	1.52	1.59
Insol.	0.25	0.11	0.06	0.18	0.19	0.19
C_3S	60	52	59	61	60	58
C_2S	17	21	16	15	14	15
C_3A	8.5	7.3	7.2	7.3	7.3	7.8
C_4AF	7.9	8.5	8.7	9.2	9.8	10.5
PHYSICAL TESTS						
Blaine	387	384	378	383	389	388
-325m	92.1	90.1	91.8	92.6	92.2	92.4
N.C.	24.3	23.6	23.6	23.6	23.6	23.6
Air	7.3	9.1	9.8	9.3	9.4	9.6
Autoclave	+0.070	+0.052	+0.054	+0.051	0.037	+0.028
Time of Set						
Initial	75	80	75	85	75	85
Final	225	240	235	250	250	275
False Set	77	76	78	80	75	77
Strength						
1 Day	2010	1400	1660	1900	1890	1880
3 Day	3780	2970	3110	3340	3460	3440
7 Day	5070	3740	4160	4400	4470	4610
28 Day	6350	4810	5310	5530	5650	5400
Pack Set	6	8	7	6	7	6

PLANT Seattle CEMENT TYPE I YEAR 1986

	JULY	AUG.	SEPT	OCT	NOV	DEC
CHEMICAL ANALYSIS						
SiO_2	20.76		20.77	21.39	21.56	
Al_2O_3	4.79		5.26	4.31	4.45	
Fe_2O_3	3.47		3.35	2.70	2.64	
CaO	64.04		65.23	64.71	64.57	
MgO	2.18		2.04	2.30	2.07	
SO_3	2.32		2.15	2.33	2.11	
Na_2O	0.24		0.28	0.24	0.25	
K_2O	0.30		0.34	0.34	0.34	
Free CaO	0.72		0.88	0.93	0.87	
Ign. Loss	1.26		1.47	1.31	1.69	
Insol.	0.12		0.15	0.13	0.14	
C_3S	59		61	61	59	
C_2S	15		13	15	17	
C_3A	6.8		8.3	6.9	7.3	
C_4AF	10.6		10.2	8.2	8.0	
PHYSICAL TESTS						
Blaine	391		389	392	384	
-325m	92.1		92.5	93.3	93.9	
N.C.	23.7		24.0	23.9	23.9	
Air	9.2		9.6	10.1	10.1	
Autoclave	+0.029		+0.041	+0.052	+0.059	
Time of Set						
Initial	80		75	75	85	
Final	275		235	265	295	
False Set	67		79	82	75	
Strength						
1 Day	1900		1870	1890	1700	
3 Day	3370		3250	3650	3160	
7 Day	4260		4020	4250	3820	
28 Day	5270		5020	5220	5020	
Pack Set	6		7	6	4	

AGC2D000131

PLANT Seattle CEMENT TYPE I YEAR 1986

	1985 AVG	1986 AVG	Standard Deviatio
CHEMICAL ANALYSIS			
SiO_2	21.05	21.08	0.35
Al_2O_3	4.99	4.74	0.30
Fe_2O_3	3.36	3.01	0.34
CaO	64.56	64.60	0.53
MgO	1.89	2.08	0.40
SO_3	2.48	2.38	0.17
Na_2O	0.27	0.23	0.04
K_2O	0.35	0.36	0.05
Free CaO	0.91	0.88	0.13
Ign. Loss	1.09	1.45	0.22
Insol.	0.14	0.15	0.05
C_3S	57	59	3
C_2S	17	16	2
C_3A	7.5	7.5	0.6
C_4AF	10.2	9.1	1.2
PHYSICAL TESTS			
Blaine	386	387	4
-325m	92.3	92.3	1.0
N.C.	24.1	23.8	0.2
Air	8.8	9.4	0.8
Autoclave	+0.041	+0.047	0.013
Time of Set			
Initial	85	80	5
Final	255	255	20
False Set	82	77	4
Strength			
1 Day	1960	1830	210
3 Day	3490	3350	246
7 Day	4480	4280	390
28 Day	5530	5360	429
Pack Set		6	-

TYPE I-D

Produced from 100% Durkee Clinker

AGC2D000133

PLANT Seattle CEMENT TYPE I-D YEAR 1986

	JAN	FEB	MAR	APR	MAY	JUNE
CHEMICAL ANALYSIS						
SiO_2	21.75		21.41	21.48		21.36
Al_2O_3	4.86		4.60	4.62		4.12
Fe_2O_3	2.59		2.67	2.80		2.86
CaO	65.64		65.05	65.30		65.40
MgO	1.16		1.93	1.37		1.44
SO_3	2.47		2.54	2.47		2.26
Na_2O	0.18		0.18	0.15		0.15
K_2O	0.48		0.40	0.41		0.36
Free CaO	1.14		0.86	0.85		0.70
Ign. Loss	0.88		1.16	1.41		1.65
Insol.	0.13		0.09	0.08		0.15
C_3S	59		60	61		66
C_2S	18		16	16		12
C_3A	8.5		7.7	7.5		6.1
C_4AF	7.9		8.1	8.5		8.7
PHYSICAL TESTS						
Blaine	378		377	383		394
-325m	92.8		91.8	92.2		92.5
N.C.	24.4		24.0	23.5		23.3
Air	8.1		8.1	7.6		9.1
Autoclave	+0.081		+0.023	+0.054		-0.003
Time of Set						
Initial	70		80	70		65
Final	210		235	220		280
False Set	81		78	83		67
Strength						
1 Day	1930		1770	1890		1830
3 Day	3600		3350	3220		3450
7 Day	4940		5410	4490		4690
28 Day	6140		5810	5600		5800
Pack Set	7		5	7		6

AGC2D000134

PLANT Seattle CEMENT TYPE I-D YEAR 1986

	JULY	AUG	SEPT	OCT	NOV	DEC
CHEMICAL ANALYSIS						
SiO_2		21.33	21.33	22.11	22.15	
Al_2O_3		4.59	4.72	4.38	4.36	
Fe_2O_3		2.80	3.15	3.01	3.02	
CaO		65.18	65.42	64.91	65.75	
MgO		1.50	1.52	1.15	0.89	
SO_3		2.35	2.28	2.32	2.31	
Na_2O		0.18	0.19	0.22	0.26	
K_2O		0.47	0.40	0.46	0.45	
Free CaO		0.63	0.40	0.30	0.55	
Ign. Loss		1.38	1.38	1.34	0.84	
Insol.		0.14	0.18	0.17	0.16	
C_3S		62	62	56	62	
C_2S		15	15	21	17	
C_3A		7.4	7.2	6.5	6.5	
C_4AF		8.5	9.6	9.2	9.2	
PHYSICAL TESTS						
Blaine		390	390	387	370	
-325m		92.3	93.3	94.2	93.8	
N.C.		24.0	24.0	23.9	24.0	
Air		8.3	8.8	9.4	9.8	
Autoclave		+ 0.015	+0.010	-0.002	-0.007	
Time of Set						
Initial		65	70	80	100	
Final		225	240	245	280	
False Set		78	74	73	68	
Strength						
1 Day		1780	1770	1800	1860	
3 Day		3350	3540	3100	3320	
7 Day		4510	4490	4380	4400	
28 Day		5590	5720	5680		
Pack Set		5	6	4	3	
18 Hr. Heat Curred						
7 Day Heat Curred						

PLANT Seattle CEMENT TYPE I-D YEAR 1986

	1985 AVG	1986 AVG	Standard Deviation
CHEMICAL ANALYSIS			
SiO_2	21.94	21.62	0.35
Al_2O_3	4.63	4.53	0.23
Fe_2O_3	2.80	2.86	0.19
CaO	65.31	65.33	0.28
MgO	1.14	1.37	0.31
SO_3	2.57	2.38	0.10
Na_2O	0.10	0.19	0.04
K_2O	0.41	0.43	0.04
Free CaO	0.77	0.68	0.27
Ign. Loss	0.99	1.26	0.28
Insol.	0.07	0.14	0.04
C_3S	57	60	3
C_2S	20	16	8
C_3A	7.5	7.2	0.8
C_4AF	8.6	8.7	0.6
PHYSICAL TESTS			
Blaine	379	384	8
-325m	92.8	92.9	0.8
N.C.	23.9	23.9	0.3
Air	8.5	8.7	0.8
Autoclave	-0.008	+0.021	+0.03
Time of Set			
Initial	80	75	12
Final	345	240	26
False Set	90	75	6
Strength			
1 Day	1840	1830	60
3 Day	3600	3370	163
7 Day	4900	4660	352
28 Day	6100	5760	174
Pack Set	6	6	-

AGC2D000136

TYPE II

Produced with 100% Tilbury Clinker

AGC2D000137

PLANT Seattle CEMENT TYPE II YEAR 1986

	JAN	FEB	MAR	APR	MAY	JUNE
CHEMICAL ANALYSIS						
SiO_2	21.20	20.89	21.07	21.50	21.26	21.12
Al_2O_3	4.68	4.59	4.78	4.74	4.72	4.91
Fe_2O_3	3.11	3.08	3.17	3.44	3.32	3.42
CaO	63.80	63.64	63.73	63.93	63.34	63.67
MgO	3.01	3.48	2.85	2.73	2.93	2.46
SO_3	2.52	2.42	2.44	2.36	2.35	2.33
Na_2O	0.22	0.21	0.27	0.27	0.27	0.28
K_2O	0.31	0.31	0.33	0.34	0.32	0.30
Free CaO	1.07	1.33	0.95	0.87	0.89	0.53
Ign. Loss	1.06	1.38	1.39	1.41	1.46	1.56
Insol.	0.07	0.14	0.11	0.18	0.13	0.16
C_3S	55	58	55	53	53	54
C_2S	19	16	19	21	21	20
C_3A	7.1	7.0	7.3	6.7	6.9	7.2
C_4AF	9.4	9.4	9.7	10.5	10.1	10.4
PHYSICAL TESTS						
Blaine	381	378	380	385	385	389
-325m	92.1	91.4	92.5	92.3	92.0	92.3
N.C.	24.2	23.6	23.7	23.6	23.7	23.7
Air	8.1	10.8	10.2	9.5	9.4	9.7
Autoclave	+0.111	+0.113	+0.075	+0.038	+0.045	+0.057
Time of Set						
Initial	70	70	80	90	85	75
Final	225	225	260	265	275	270
False Set	81	81	79	75	77	71
Strength						
1 Day	1800	1650	1740	1650	1740	1710
3 Day	3110	3090	2750	3050	3100	3140
7 Day	4060	3670	3940	3950	4030	4070
28 Day	5380	4970	5320	5250	5400	5340
Pack Set	9	7	7	6	6	6

AGC2D000138

PLANT Seattle CEMENT TYPE II YEAR 1986

	JULY	AUG	SEPT	OCT	NOV	DEC
CHEMICAL ANALYSIS						
SiO_2	21.12	21.25	21.16	21.62	21.77	
Al_2O_3	4.92	4.95	5.02	4.65	4.62	
Fe_2O_3	3.43	3.47	3.52	2.88	2.89	
CaO	63.72	63.60	64.52	64.22	64.50	
MgO	2.25	2.40	2.19	2.38	2.25	
SO_3	2.37	2.40	2.18	2.33	2.25	
Na_2O	0.27	0.29	0.29	0.24	0.26	
K_2O	0.28	0.35	0.35	0.29	0.31	
Free CaO	0.66	0.99	0.99	0.72	0.73	
Ign. Loss	1.79	1.47	1.48	1.23	1.33	
Insol.		0.17	0.14	0.14	0.16	
C_3S	54	52	57	55	55	
C_2S	20	21	17	20	21	
C_3A	7.3	7.3	7.3	7.5	7.4	
C_4AF	10.4	10.5	10.7	8.7	8.8	
PHYSICAL TESTS						
Blaine	390	391	390	387	386	
-325m	92.6	92.5	93.1	92.8	93.4	
N.C.	23.7	23.8	24.0	23.9	23.9	
Air	9.3	9.4	9.5	9.7	9.6	
Autoclave	+0.034	+0.057	+0.056	+0.041	+0.117	
Time of Set						
Initial	70	70	75	80	70	
Final	255	260	250	235	240	
False Set	74	77	75	75	75	
Strength						
1 Day	1810	1730	1740	1720	1430	
3 Day	3220	3050	2930	3130	2640	
7 Day	3980	3750	3740	3840	3350	
28 Day	5170	5060	4910	5180		
Pack Set	6	7	7	8	6	
18 Hr. Heat Curred						
7 Day Heat Curred						

AGC2D000139

PLANT Seattle CEMENT TYPE II YEAR 1986

	1985 AVG	1986 AVG	Standard Deviation
CHEMICAL ANALYSIS			
SiO_2	21.71	21.27	0.26
Al_2O_3	4.70	4.78	0.15
Fe_2O_3	3.26	3.25	0.25
CaO	64.04	63.88	0.38
MgO	2.07	2.63	0.41
SO_3	2.46	2.36	0.09
Na_2O	0.27	0.26	0.03
K_2O	0.31	0.32	0.02
Free CaO	0.93	0.88	0.22
Ign. Loss	1.18	1.41	0.18
Insol.	0.13	0.14	0.03
C_3S	53	55	2
C_2S	22	20	2
C_3A	7.0	7.2	0.2
C_4AF	10.0	9.9	0.7
PHYSICAL TESTS			
Blaine	384	386	4
-325m	91.7	92.5	0.5
N.C.	24.0	23.8	0.2
Air	8.6	9.6	0.7
Autoclave	+0.040	+0.068	+0.032
Time of Set			
Initial	75	75	7
Final	245	250	17
False Set	82	76	3
Strength			
1 Day	1650	1700	103
3 Day	3050	3020	177
7 Day	3820	3850	216
28 Day	5120	5130	271
Pack Set	8	7	-

AGC2D000140

TYPE III

Produced from 100% Durkee Clinker

AGC2D000141

PLANT Seattle CEMENT TYPE III YEAR 1986

	JAN	FEB	MAR	APR	MAY	JUNE
CHEMICAL ANALYSIS						
SiO_2				21.36		20.78
Al_2O_3				4.08		4.07
Fe_2O_3				2.76		2.74
CaO				65.33		64.79
MgO				1.16		1.28
SO_3				3.24		3.36
Na_2O				0.15		0.16
K_2O				0.43		0.42
Free CaO				0.92		0.66
Ign. Loss				2.10		2.20
Insol.				0.20		0.18
C_3S				63		65
C_2S				14		11
C_3A				6.1		6.2
C_4AF				8.3		8.3
PHYSICAL TESTS						
Blaine				537		556
-325m				96.7		96.7
N.C.				25.0		25.1
Air				8.1		8.1
Autoclave				-0.020		-0.002
Time of Set						
Initial				60		60
Final				210		200
False Set				55		42
Strength						
1 Day				2530		2520
3 Day				4570		4550
7 Day				5500		5660
28 Day				6330		6500
Pack Set				8		6
18 Hr. Heat Curred				4140		4390
7 Day Heat Curred				5240		5590

PLANT Seattle CEMENT TYPE III YEAR 1986

	JULY	AUG	SEPT	OCT	NOV	DEC
CHEMICAL ANALYSIS						
SiO_2		20.98	20.97	21.39	21.55	
Al_2O_3		4.22	4.31	4.20	4.39	
Fe_2O_3		2.75	2.87	2.89	2.82	
CaO		64.62	65.45	64.43	63.94	
MgO		1.21	1.20	1.03	1.20	
SO_3		3.20	3.31	3.30	2.66	
Na_2O		0.35	0.17	0.17	0.25	
K_2O		0.29	0.39	0.40	0.41	
Free CaO		.56	0.38	0.38	0.37	
Ign. Loss		2.27	2.22	2.16	2.25	
Insol.		.20	0.19	0.18	0.18	
C_3S		62	65	58	55	
C_2S		13	12	17	20	
C_3A		6.5	6.6	6.3	6.9	
C_4AF		8.4	8.7	8.8	8.6	
PHYSICAL TESTS						
Blaine		560	578	576	576	
-325m		96.9	97.0	97.8	97.6	
N.C.		25.4	24.9	25.4	25.4	
Air		7.3	9.1	8.3	8.4	
Autoclave		+0.113	+0.033	-0.032	-0.008	
Time of Set						
Initial		65	60	65	60	
Final		260	255	240	210	
False Set		47	44	43	57	
Strength						
1 Day		2570	2760	2790	2790	
3 Day		4600	4750	4810	4680	
7 Day		5510	5660	5490	5230	
28 Day		6450	6400	6350		
Pack Set		9	6	6		
18 Hr. Heat Curred		4240	4370	4190		
7 Day Heat Curred		5150	5240	5110		

AGC2D000143

PLANT Seattle CEMENT TYPE III YEAR 1986

	1985 AVG	1986 AVG	Standard Deviation
CHEMICAL ANALYSIS			
SiO_2	21.40	21.17	0.30
Al_2O_3	4.55	4.19	0.13
Fe_2O_3	2.84	2.81	0.06
CaO	64.66	64.76	0.57
MgO	1.09	1.18	0.08
SO_3	3.36	3.18	0.26
Na_2O	0.18	0.21	0.08
K_2O	0.42	0.39	0.05
Free CaO	0.99	0.55	0.22
Ign. Loss	1.46	2.20	0.06
Insol.	0.14	0.19	0.01
C_3S	56	52	4
C_2S	19	14	4
C_3A	7.3	6.4	0.3
C_4AF	8.5	8.5	0.2
PHYSICAL TESTS			
Blaine	532	564	16
-325m	95.9	97.1	0.5
N.C.	25.6	25.2	0.2
Air	7.2	8.2	0.6
Autoclave	-0.028	-0.018	+0.013
Time of Set			
Initial	60	60	3
Final	180	230	26
False Set	46	48	6
Strength			
1 Day	2910	2660	133
3 Day	4780	4660	105
7 Day	5920	5510	157
28 Day	6750	6380	99
Pack Set	5	7	-
18 Hr. Heat Curred	4410	4230	138
7 Day Heat Curred	5640	5200	240

AGC2D000144

MASONRY

AGC2D000145

PLANT Seattle CEMENT TYPE Masonry - Type N YEAR 1986

		1985 AVG		1986 AVG		
CHEMICAL ANALYSIS						
SiO_2						
Al_2O_3						
Fe_2O_3						
CaO						
MgO						
SO_3		1.58		1.38		
Na_2O						
K_2O						
Free CaO						
Ign. Loss		22.51		22.66		
Insol.						
C_3S						
C_2S						
C_3A						
C_4AF						
PHYSICAL TESTS						
Blaine		704		768		
-325m		93.3		92.9		
N.C.						
Air		17.9		19.8		
Autoclave		+0.026		+0.090		
Time of Set, Gilmore						
Initial		165		150		
Final		330		320		
Water Retention		84		87		
Strength						
1 Day		-		-		
3 Day		830		890		
7 Day		1020		1140		
28 Day		1200		1410		
Pack Set						

AGC2D000146

EXCHANGED CEMENTS

For

Ideal Basic Industries

Seattle

AGC2D000147

TYPE I

AGC2D000148

PLANT IDEAL - SEATTLE CEMENT TYPE I YEAR 1986

	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
CHEMICAL ANALYSIS							
SiO_2	20.82	21.01			20.82	21.17	21.47
Al_2O_3	5.47	5.49			5.48	5.48	5.32
Fe_2O_3	3.14	3.15			3.26	2.88	2.85
CaO	64.54	64.40			64.36	64.59	64.17
MgO	1.17	1.17			1.12	1.09	1.38
SO_3	2.79	2.76			2.95	2.83	2.68
Na_2O	0.45	0.39			0.35	0.50	0.49
K_2O	0.27	0.28			0.44	0.39	0.40
Free CaO	0.19	0.26			0.34	0.33	0.28
Ign. Loss	1.41	1.27			1.08	0.96	1.34
Insol.	-	-			-	-	-
C_3S	55	53			54	53	51
C_2S	18	20			19	21	23
C_3A	9.2	9.2			9.0	9.7	9.3
C_4AF	9.5	9.6			9.9	8.8	8.7
PHYSICAL TESTS							
Blaine	400	404			442	453	448
-325m	91.4	92.9			95.6	93.8	94.6
N.C.	24.9	25.2			25.6	25.6	25.7
Air	9.1	8.6			8.4	8.7	8.5
Autoclave	+0.005	+0.024			-0.007	+0.015	-
Time of Set							
Initial	110	115			120	80	90
Final	310	305			300	255	265
False Set	82	88			84	71	74
Strength							
1 Day	2060	2020			2480	2230	2060
3 Day	3700	3680			3650	3690	3720
7 Day	5090	5000			5030	4380	4860
28 Day	6120	6380			6400	5910	
Pack Set	-	-			-	-	

AGC2D000149

PLANT Ideal - Seattle CEMENT TYPE I YEAR 1986

		1985 AVG		1986 AVG		Standard Deviation
CHEMICAL ANALYSIS		N.A.				
SiO_2				21.06		0.27
Al_2O_3				5.45		0.07
Fe_2O_3				3.06		0.18
CaO				64.41		0.17
MgO				1.19		0.11
SO_3				2.80		0.10
Na_2O				0.44		0.06
K_2O				0.36		0.08
Free CaO				0.28		0.06
Ign. Loss				1.21		0.19
Insol.				-		-
C_3S				53		1
C_2S				20		2
C_3A				9.3		0.3
C_4AF				9.3		0.5
PHYSICAL TESTS						
Blaine				429		25
-325m				93.7		1.6
N.C.				25.4		0.3
Air				8.7		0.3
Autoclave				+0.009		+0.013
Time of Set						
Initial				105		17
Final				285		25
False Set				80		7
Strength						
1 Day				2170		191
3 Day				3690		26
7 Day				3960		118
28 Day				6200*		233
Pack Set				-		-

*Does not include December.

TYPE II

AGC2D000151

PLANT IDEAL - SEATTLE CEMENT TYPE II YEAR 1986

	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
CHEMICAL ANALYSIS							
SiO_2	21.15	21.73	21.72	22.16	22.05	21.97	22.37
Al_2O_3	4.92	5.10	4.94	4.63	4.80	4.82	4.44
Fe_2O_3	3.41	3.26	3.28	3.35	3.10	2.96	2.94
CaO	64.58	64.56	64.45	64.96	65.02	65.05	64.84
MgO	1.39	1.13	1.19	1.05	0.94	1.01	1.11
SO_3	2.62	2.53	2.53	2.45	2.59	2.50	2.48
Na_2O	0.43	0.34	0.35	0.36	0.32	0.39	0.39
K_2O	0.27	0.28	0.29	0.34	0.32	0.33	0.32
Free CaO	0.17	0.20	0.45	0.43	0.29	1.05	0.31
Ign. Loss	1.75	1.15	1.16	1.15	0.98	0.96	1.31
Insol.	-	-	-	-	-		
C_3S	57	52	52	54	53	54	53
C_2S	18	23	23	23	23	22	24
C_3A	7.3	8.0	7.6	6.6	7.5	7.9	6.8
C_4AF	10.4	9.9	10.0	10.2	9.4	9.0	8.9
PHYSICAL TESTS							
Blaine	375	364	366	372	380	396	383
-325m	90.7	90.8	89.5	91.8	92.3	91.8	91.8
N.C.	24.7	24.7	24.7	24.5	24.5	24.6	24.6
Air	8.8	9.0	9.0	8.9	8.9	8.3	8.4
Autoclave	+0.004	+0.019	-0.021	+0.013	+0.013	+0.007	+0.009
Time of Set							
Initial	135	125	115	100	110	85	110
Final	330	320	305	280	275	255	275
False Set	84	92	78	79	79	78	75
Strength							
1 Day	1710	1700	1560	1700	1650	1700	1560
3 Day	3280	3020	2920	3020	2870	2950	2730
7 Day	4590	4260	4000	4010	4090	4160	4080
28 Day	6180	6030	5470	5510	5690	5610	
Pack Set	-	-	-	-	-	-	-

PLANT Ideal -Seattle CEMENT TYPE II YEAR 1986

		1985 AVG		1986 AVG		Standard Deviation
CHEMICAL ANALYSIS		N.A.				
SiO_2				21.86		0.37
Al_2O_3				4.81		0.22
Fe_2O_3				3.19		0.19
CaO				64.78		0.25
MgO				1.12		0.15
SO_3				2.53		0.06
Na_2O				0.37		0.04
K_2O				0.31		0.03
Free CaO				0.31		0.11
Ign. Loss				1.22		0.25
Insol.				-1		-
C_3S				54		2
C_2S				22		2
C_3A				7.4		0.5
C_4AF				9.7		0.6
PHYSICAL TESTS						
Blaine				377		11
-325m				91.2		1.0
N.C.				24.6		0.1
Air				8.9		0.3
Autoclave				+0.006		+0.014
Time of Set						
Initial				110		16
Final				290		27
False Set				81		6
Strength						
1 Day				1650		67
3 Day				2970		169
7 Day				4170		206
28 Day				5750*		291
Pack Set				-		-

*Does not include December.

AGC2D000153

CEMENT STRENGTH UNIFORMITY ASTM C-917

AGC2D000154

ASH GROVE CMENT WEST, INC
Seattle, Washington
Sampled from Bulk Truck Shipments
Ash Grove Cement West, Inc., Seattle Laboratory

TYPE II

REPORT DATE - October 8, 1986

ITEM	7 DAY	28 DAY
Dates Represented		
From	7/23/86	
To	9/24/86	
Average Strength, PSI, $\overline{X}$	3860	5030
Total Standard Deviation, PSI, S_t	158	171
Number of tests, n	30	30
Testing Standard Deviation, PSI, Se	131	137
Number of Duplicate Samples	4	4
Corrected Standard Deviation, PSI, S_c	88	102

COMPRESSIVE STRENGTHS

Date	Sample #	7 Day		28 Day	
		Sample	Average 5	Sample	Average 5
7/23	1	4030	-	5290	-
7/23	1A	3940 (A)	-	5180 (A)	-
7/24	2	3880	-	4960	-
7/25	3	3730	-	5020	-
7/29	4	3840	-	5060	-
7/30	5	3840	3860	5040	5070
7/30	6	3840	3830	5050	5030
8/5	7	3900	3830	5330	5100
8/6	8	3950	3870	5180	5130
8/6	9	3880	3880	4890	5100
8/12	10	3930	3900	5300	5150
8/12	10A	4170 (A)	-	5330 (A)	-
8/14	11	3910	3900	4960	5130
8/14	12	4130	3950	5340	5130
8/19	13	3680	3890	5020	5100
8/20	14	3980	3910	5140	5150
8/21	15	3600	3850	4760	5040
8/25	16	3880	3840	4900	5030
8/26	17	4270	3870	5430	5050
8/27	18	3930	3920	5040	5050
9/2	19	3830	3890	5080	5040
9/3	20	3680	3910	4970	5080
9/3	20A	3820 (A)	-	5160 (A)	-
9/4	21	3870	3900	4980	5080
9/8	22	3640	3780	4950	4990
9/9	23	3780	3750	5020	4990

ASH GROVE CEMENT WEST, INC.
Seattle, Washington
Sampled from Bulk Truck Shipments
Ash Grove Cement West, Inc., Seattle Laboratory

Date	Sample #	7 Day		28 Day	
		Sample	Average 5	Sample	Average 5
9/10	24	3850	3750	4950	4960
9/15	25	3600	3740	4980	4960
9/16	26	3590	3680	4790	4920
9/17	27	4080	3770	4800	4890
9/22	28	3980	3810	4910	4870
9/23	29	3900	3820	4780	4840
9/24	30	3790	3860	4980	4840
9/24	30A	3670 (A)	-	4690 (A)	-

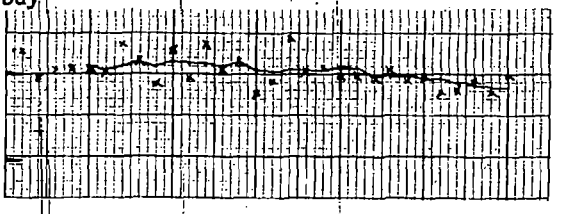
NOTE: Samples followed by an "A" are not included in the averages. They are used to determine testing deviation.

ASH GROVE CEMENT WEST, IN
Seattle, Washington
Sampled from Bulk Trucks Shipments
Ash Grove Cement West, Inc., Seattle Laboratory
Page Three

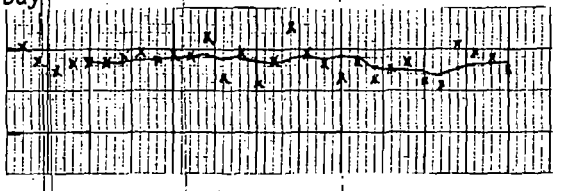
TYPE II, LA

ASTM C-109 MORTAR

28 Day



7 Day



Average Strength PSI

$\overline{X}_7$ = 3860 n = 30

$\overline{X}_{28}$ = 5030 n = 30

Average 5 Most Recent, PSI

$\overline{X}_{5-7}$ = 3860

$\overline{X}_{5-28}$ = 4840

Total Standard Deviation, PSI

S_{t-7} = 158 n = 30

S_{t-29} = 171 n = 30

Testing Standard Deviation, PSI

Se_7 = 131 n = 4

Se_{28} = 137 n = 4

Corrected Standard Deviation, PSI

S_{c-7} = 88

S_{c-28} = 102

AGC2D000157

CUSTOMER COMPLAINTS

AGC2D000158

Complaints Seattle Products

Type I - February	-	Poor paint adhesion to concrete tilt-up section Miles Sand & Gravel, Auburn, Washington Concrete was not allowed to cure long enough to carbonize the surface and raise the surface pH to acceptable levels for paint application.
Type II - January	-	Poor flowability, pack set Ameron Pipe, Inc., Olympia, Washington Shipping samples indicated high pack set index. Switched all flowability sensitive customers to a different production run.
- February	-	High water demand, flash set, slump loss Pioneer Construction Materials, Seattle, WA Samples did not indicate any deviations from normal production test results. Subsequent shipments were made to Pioneer from a different production run.
- March	-	Surface scaling of concrete Salmon Bay Sand & Gravel, Seattle, Washington Concrete sample looked as if screeding had been replaced on the slab to fill a low area. This material would be more susceptible to freeze thaw spalling.
Type III - February	-	Efflorescence Automatic Wilbert Vault, Tacoma, Washington No samples provided, no tests requested. This product was made from 100% Genstar Type I and is not currently produced in Seattle.
- April	-	Lower strength gain on heat curing Concrete Technology Corp., Tacoma, Washington Cement shipped from silo with low inventory, i.e., cement from developmental runs of this product. This cement also had a lower than normal C_3S content. Shipments resumed after next production run.
Masonry - September	-	Shorter board life in mortar Mutual Materials, Bellevue, Washington No sample provided. Warehouse samples showed no difference from previous production samples.

AGC2D000159

Customer-Complaints Non-Seattle Products

Low strength gain

Ash Grove Durkee - Type I

December - Capital Block, Salem, Oregon
Riverbend Sand & Gravel, Independence, Oregon
Umpqua Ready Mix, Roseburg, Oregon

Ash Grove Durkee - Type II

February - Ameron Pipe Inc., Portland, Oregon

Ideal Basic Industries Seattle - Type III

December - Pioneer Construction Materials, Seattle, Washington

Flash set, high water demand slump loss

Ash Grove Durkee - Type I

July - Parson Ready-Mix, Eugene, Oregon
Eugene Sand & Gravel, Eugene, Oregon

Kaiser Seattle - Type II

September - Dutch Stevenson, Tumwater, Washington

Gel-like white deposits on and in concrete

Ideal Basic Industries Seattle - Type II

October & November - Pioneer Construction Materials, Seattle, Washington

Lumps on tile and balling in the mixer

Ash Grove Durkee - Type I

July - Spec Industries, Eugene, Oregon

AGC2D000160

10: Jim Post
F. Plant Reports
1986

ASH GROVE CEMENT COMPANY

DEC -5 1986

Overland Park, Kansas

FILE

EXEC 1-26

TO: Ken Rone

FROM: James P. Sunderland

SUBJECT: Annual Report to President Reviewing 1986 Seattle Cement Plant

DATE: December 3, 1986

Your Annual Report to President, covering the activities under your control and describing the results accomplished during the year ending December 31, 1986, should be addressed to James P. Sunderland, President, and forwarded to this office at the earliest practicable date, but in no event later than January 31, 1987.

The first sheet of the report should carry as its heading the caption shown above.

?

In preparing the report, please follow the form used in making your report for 1985 and furnish in triplicate, forwarding copies to Mr. R.E. Willis, Senior Vice President - Operations and Mr. G. D. Jones, Vice President - Production.

Any suggestions or recommendations you desire to submit should be incorporated in your report.

Please acknowledge receipt.

JPS:BJ

cc: Erik Voldbaek

Jim - I HAVE NEVER SEEN INSTRUCTIONS AS TO THE PROPER FORM TO USE. I HAVE SEEN A COPY OF DURKEE'S FOR 1985. IS THAT CORRECT? — KR