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PORTLAND CEMENT CONCRETE PAVEMENT REVIEW OF QC/QA DATA 2000 THROUGH 2004

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16. Abstract

This report analyzes the Quality Control/Quality Assurance (QC/QA) data for Portland Cement Concrete Pavement (PCCP) constructed in the years 2000 through 2004. Analysis of the overall performance of the projects was accomplished by reviewing the Calculated Pay Factor Composite (CPFC) and Incentive/Disincentive Payments (I/DP). Analysis of each of the test elements: thickness, compressive strength, sand equivalent, and flexural strength has been completed. The results of the evaluation are presented in tables, figures, and reports.

The PCCP on the projects evaluated from 2000 through 2004 have shown good test results. The average incentive payment is above 3.8% in each of the years. Over the five-year time period the average is above 3.9%, maximum incentive being 5%. All projects evaluated received some amount of incentive payment for the PCCP. Of the 36 projects evaluated 19 received incentive payments greater than 4%. Two of these projects received the maximum incentive of 5%. Over the five-year time period the CPFC has remained at a constant level.

When evaluating each of the test elements we find that of the twenty data groupings used, year and test element, only two of these have an average quality level that is less than 98% within specification limits. All of the average pay factors for the elements are above the 1.0 mark signifying that on average incentives have been paid on those elements. Many of the pay factors for the individual elements are approaching the maximum allowable values. Two factors affect the quality level calculations, the mean for the process in relationship to the target value and the standard deviation of the process in comparison to the V value. The mean to TV calculations shows that the material being produced is above the target value for the elements.   When analyzing the standard deviations for the test elements we find that most of the material being produced is below the variation of the historical data. All of the element quality levels are essentially remaining at a constant level. The percent within specification limits is at a very high percentage, above 98%.

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Portland Cement Concrete Pavement Review of QC/QA Data 2000 Through 2004

by

Eric Chavez

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1.0 INTRODUCTION AND COMMENTS

The Colorado Department of Transportation (CDOT) began Quality Control/Quality Assurance (QC/QA) construction of portland cement concrete pavement (PCCP) in 1997 with the release of Revision to Sections 105, & 106 Quality of Portland Cement Concrete Pavement as a pilot specification. In 1998 additional projects were awarded under revised pilot specifications. The specification became a Standard Special Provision in 2000 with the release of "Revision to Sections 105, 106, & 412 Quality of Portland Cement" and "Revision to Sections 105, 106, & 412 Quality of Portland Cement Concrete Pavement (Alternative Strength Criteria)."

This report analyzes the PCCP data for the years 2000 through 2004. The projects are evaluated by analyzing the Calculated Pay Factor Composite (CPFC) and Incentive/Disincentive Payment (I/DP). Each of the test elements: thickness, compressive strength, sand equivalent, & flexural strength is also evaluated. The data is evaluated by year and yearly reports are presented in this report. Charts comparing the quality level and pay factor information for the years 2000 through 2004 are displayed for each of the test elements. A detailed report containing project data for the year 2004 is presented.

Two major changes were made in this report as compared to the previous report, "Portland Cement Concrete Pavement Review of QC/QA Data 2000 to 2003." The first change is that the major data grouping is now by start date instead of bid date as in the previous report. The start date is defined as the date the paving process began. The bid date, also the award date, is the day on which the project was awarded to contract. On numerous projects the paving did not began in the same year as the project was awarded. In a couple of cases the paving began in the second year after the project was awarded. The new data grouping more accurately groups the projects together according to the time frame in which the paving began. The second change is that in some of the reports the data for the metric projects, SI, has been converted to the USA unit. The evaluations are now completed using all of the projects instead of splitting the projects into the two different data groupings, USA and SI.

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2.0 SPECIFICATIONS

Specifications – "Revision of Sections 105, 106, and 412 Quality of Portland Cement Concrete Pavement" and *"Revision of Sections 105, 106, and 412 Quality of Portland Cement Concrete Pavement (Alternate Strength Criteria)."* These specifications govern all of the QC/QA calculations used for portland cement concrete pavements. The material is grouped into processes for evaluation. Processes group like material or construction techniques together. As long as the material being evaluated remains unchanged it will be added to the current process. New processes will be created if the material changes or if the construction technique is changed. See the Revision to Sections 105, 106, and 412 for details on processes. An Incentive/Disincentive Payment (I/DP) is calculated for each process. I/DPs on processes that contain one and two tests are calculated using the small quantity equation. Quality levels (Percent within limits) are calculated on all processes that contain more than two tests. The calculations for quality level follow Colorado Procedure 71, see the procedure for details.

When compressive strength criteria is used the calculations for I/DP will be based on the results of three elements: thickness, compressive strength, and sand equivalent. When flexural strength criteria is used the calculations for I/DP will be based on two elements: thickness and flexural strength. The maximum incentive payment for the PCCP is 5% under either of the testing criteria. The maximum pay factor for each of the test elements is listed in Table 1.

Table 1. Maximum Pay Factor for Various Elements

Element	Maximum Pay Factor
Thickness	2%
Compressive Strength	2%
Sand Equivalent	1%
Flexural Strength	3%

Pay factors will be calculated for each process using the following equations:

A.   For compressive strength and pavement thickness:
When $3 \leq Pn \leq 5$
If $QL \geq 85$, then $PF = 1.00 + (QL - 85)0.001333$
If $QL < 85$, then $PF = 1.00 + (QL - 85)0.005208$

When $6 \leq Pn \leq 9$
If $QL \geq 90$, then $PF = 1.00 + (QL - 90)0.002000$
If $QL < 90$, then $PF = 1.00 + (QL - 90)0.005682$

When $10 \leq Pn \leq 25$
If $QL \geq 93$, then $PF = 1.00 + (QL - 93)0.002857$
If $QL < 93$, then $PF = 1.00 + (QL - 93)0.006098$
When $Pn \geq 26$
If $QL \geq 95$, then $PF = 1.00 + (QL - 95)0.004000$
If $QL < 95$, then $PF = 1.00 + (QL - 95)0.006757$

B.   For flexural strength:
When $3 \leq Pn \leq 5$
If $QL \geq 85$, then $PF = 1.00 + (QL - 85)0.002000$
If $QL < 85$, then $PF = 1.00 + (QL - 85)0.005208$

When $6 \leq Pn \leq 9$
If $QL \geq 90$, then $PF = 1.00 + (QL - 90)0.003000$
If $QL < 90$, then $PF = 1.00 + (QL - 90)0.005682$

When $10 \leq Pn \leq 25$
If $QL \geq 93$, then $PF = 1.00 + (QL - 93)0.004286$
If $QL < 93$, then $PF = 1.00 + (QL - 93)0.006098$

When $Pn \geq 26$
If $QL \geq 95$, then $PF = 1.00 + (QL - 95)0.006000$
If $QL < 95$, then $PF = 1.00 + (QL - 95)0.006757$

C.   For sand equivalent:
When $3 \leq Pn \leq 5$
If $QL \geq 85$, then $PF = 1.00 + (QL - 85)0.000667$
If $QL < 85$, then $PF = 1.00 + (QL - 85)0.005208$

When $6 \leq Pn \leq 9$
If $QL \geq 90$, then $PF = 1.00 + (QL - 90)0.001000$
If $QL < 90$, then $PF = 1.00 + (QL - 90)0.005682$

When $10 \leq Pn \leq 25$
If $QL \geq 93$, then $PF = 1.00 + (QL - 93)0.001429$
If $QL < 93$, then $PF = 1.00 + (QL - 93)0.006098$

When $Pn \geq 26$
If $QL \geq 95$, then $PF = 1.00 + (QL - 95)0.002000$
If $QL < 95$, then $PF = 1.00 + (QL - 95)0.006757$

The I/DP for the process is calculated using the following equation:

$$I/DP = (PF-1)(QR)(UP)$$

where: QR = Quantity Represented by the process.
UP = Unit Price bid for the Item.

The total I/DP for an element shall be computed by accumulating the individual I/DP for each process of that element.

The I/DP for the project will be the summation of all calculated I/DPs.

The calculations for pay factor and Incentive/Disincentive Payment have remained unchanged since the release of the Standard Special Provisions in 2000. The calculation for quality levels has remained unchanged since the beginning. Use of CDOT's QC/QA computer program is a requirement of the specification. The computer program is based on this specification.

3.0 CALCULATIONS AND DEFINITIONS

Process Quantities – Process quantities are used for all calculations in this report except for the calculation of the Calculated Pay Factor Composite. In general, processes group like material or construction techniques together. As long as the material being evaluated remains unchanged it will be added to the current process. If a change to the material or the construction technique occurs then a new process will be created. Please see the Revision to Sections 105, 106, and 412 Quality of Portland Cement Concrete Pavement for details on processes.

Award Date – The date on which the project was awarded to contract.

Bid Date – Same as Award Date.

Calculated Pay Factor Composite (CPFC) – The Calculated Pay Factor Composite is a way to evaluate the overall quality of the PCCP used on the project. The CPFC

represents the percentage increase or decrease to the unit price for PCCP paid on the project. Projects with a CPFC greater than 1.0 will have received an incentive payment. Projects with a CPFC less than 1.0 will have received a disincentive payment. The CPFC is back calculated from the project's Final Incentive/Disincentive Payment (I/DP). This calculation is used rather than an overall quality level calculation since a project can contain processes in which no quality level is calculated, processes with less than three tests. The calculation used also addresses the problem which occurred in some of the reported projects in which the final element quantities were not equal. This calculation is used in order to avoid the problems associated with averaging of the data. The original testing unit and quantities are used in the calculation. The calculation is as follows:

$$CPFC = (I/DP / ((UP_P) * (QR_P))) + 1$$

Where: CPFC = Calculated Pay Factor Composite.

          I/DP   = Incentive/Disincentive Payment for the project.

          UP_P = Calculated Unit Price for the project.

          QR_P = Quantity Represented Project, average of the reported element quantities.

$$UP_P = (\sum (UP_n * Q_n)) / \sum Q_n$$

Where: UP_n = Unit Price for the process.

          Q_n = Quantity represented by the process, thickness element only.

I/DP (Incentive/Disincentive Payment) - The amount of increase or decrease paid for a quantity of material within a test element. The I/DP for a project is the summation of all calculated element I/DPs.

LSL (Lower Specification Limit) – The lower limit of the specification range. All of the test elements used in testing PCCP only have a LSL. The LSL used in the thickness element is plan thickness minus 4 tenths of an inch or 10 mm.

Mean to TV - The difference between the mean for the process and the target value for the test element. Negative numbers indicate that the mean for the process is below the

target value for the element. Positive numbers indicate that the mean for the process is above the target value. A mean above the target value, positive values, indicates that the mean is moving farther away from the lower specification limit on lower specification limit only tests. All of the PCCP test elements have only a lower specification test limit. Positive values, and the higher that value is, increase the likelihood that more of the test results will be in specification. The mean for the process in relationship to the specification limits is one of the two factors that affect the calculation for quality level. The other factor is the standard deviation for the process.

Pay Factor - The amount of increase or decrease, displayed as a percentage, applied to the unit price for the quantity of material represented by the process for a test element.

Project Code – An alpha-numeric identifier unique to each project.

PT (Plan Thickness) – The planned thickness of the pavement. The lower tolerance limit (TL) used in the thickness element is PT minus 0.4 inches (10 mm). TL is used in the calculations for quality level and Incentive/Disincentive Payment.

Quality Level – Quality levels (Percent within limits) are calculated in accordance with Colorado Procedure 71. Quality level analysis is a statistical procedure for estimating the percent compliance to specification limits and is affected by shifts in the arithmetic mean and by the sample standard deviation. Analysis of both factors is essential whenever evaluating quality level results.

Slope of the regression line   equation: $b = \dfrac{\sum (x - \bar{x})(y - \bar{y})}{\sum (x - \bar{x})^2}$

Slope shows both steepness and direction. With positive slope the line moves upward when going from left to right. With negative slope the line moves down when going from left to right. The higher the value the steeper the line.

Start Date – The date on which the paving process first began on the project.

Std. Dev. (Standard Deviation) equation: $s = \sqrt{\dfrac{\sum(X - \overline{X})^2}{n-1}}$

Std. Dev. – V (Standard Deviation minus the V Factor) - A comparison of the standard deviation for the process to the historical standard deviation for the element, the V Factor. Negative values indicate that the process has a smaller standard deviation than historically reported. The lower this calculated value the better. The standard deviation for the process is one of the two factors that affect the calculation for quality level. The other factor is the mean for the process in relationship to the specification limits.

Subaccount – A five digit numeric identifier unique to each project.

Trendline equation: $y = mx + b$

> Where: m = slope of the line.
> b = y-intercept.

TV (Target Value) - A calculated value for the mean of a process which would result in 85% of the material being within specification limits if it was produced at the same standard deviation as historical data, the V factor. The target value for the compressive strength, sand equivalent, and flexural strength elements is the lower specification limit plus V times 1.65. For the thickness element the target value is plan thickness plus V times 0.65. The lower specification limit in the thickness element is plan thickness minus 0.4 of an inch or 10 mm.

V (V Factor) - One standard deviation for the test element based on historical data.

Weighted Average – The weighted average calculation used in this report is calculated based on the amount of material represented.

4.0 CONVERSION OF TEST UNITS

Some of the projects evaluated in this report were constructed using the System International (SI) metric units of measure. These measurements were converted to USA units in the following reports: calculated pay factor composite, thickness, compressive strength, sand equivalent, and flexural strength. Projects constructed using the SI units are shown with "SI" in the "orig. unit" column in these reports. The calculation for calculated pay factor composite was completed using the original unit of measurement. Only in reports 2 and 3 is the unit price converted into an equivalent square yard value. In all other reports the unit price displayed is the original bid price. The data in the Project Data report, report 8, is presented in the original unit of measurement without any conversion. In Tables 3 and 4 the measurement for area is shown as a combination of units, SY/m2. Here the units were simply added together for ease of calculating. The following conversion factors were used:

Table 2. Conversion Factors

Conversion Factors – Metric S.I. to U.S.		
Metric Unit (SI)	U.S.	Multiply by
square meter	square yard	1.195 99
millimeter (mm)	inch	0.039 37
kilopascals (kPa)	psi	0.145 038

5.0 DESCRIPTION OF REPORTS

In general, the amount of detail contained in the reports increases as you proceed through this report, summary or recap reports appear first. Detailed reports that contain all of the data appear in the appendices.

Report Criteria – At the beginning of each report the selection criteria are listed for the data contained in the report. The primary grouping of all of the reports is by start date,

the date on which the actual paving began. Quality levels are not calculated on processes that contain less than three test results. Therefore, these processes are excluded from the reports that contain quality level calculations. Other justifications as to why a project or process is excluded from the report are detailed in the report criteria.

Sample Size – Not too many conclusions should be drawn when the number of observations, sample size, is small. Generally speaking, an evaluation of five or less samples is not considered very reliable. Always check the number of samples included in the evaluation when doing comparisons of the data. Most of the reports presented here will indicate the number of samples included in the various data groupings. Figures in this report will have associated tables that will give the number of samples included.

Project Listing, report 1. This report contains project information for the projects included in the evaluation with start dates from 1/1/2000 through 12/31/2004. The report is grouped by year and is sorted by subaccount. The subaccount, start date, bid date, test criteria, region, project code, location, total plan quantity, testing units, and supplier ID are listed for each project. Totals are calculated for each of the testing criteria and for the test unit.

Calculated Pay Factor Composite and I/DP, reports 2 & 3. These reports evaluate two key calculations for each project, the Calculated Pay Factor Composite (CPFC) and the project Incentive/Disincentive Payment (I/DP). The Calculated Pay Factor Composite gives an index of the overall quality of the PCCP; see Calculations and Definitions for details on the calculation of the CPFC. The I/DP is the incentive or disincentive amount the project received for the PCCP. Report 2 groups the projects by year. For each year the total and average quantities are displayed in USA units. A calculated average price in USA units is also displayed. The maximum and minimum values for CPFC and I/DP are given for each year. A weighted average is calculated for CPFC. A non-weighted average is calculated for I/DP for each year. At the end of the report the maximum, minimum, and weighted averages are given for the start date

range contained in the report.   Report 3 contains the same data and calculations as report 2 except that the projects are first grouped by test criteria, compressive strength or flexural strength, and then by year. This allows an easier comparison of the projects that were constructed using that type of testing criteria.

Process Information by Year: Thickness, Compressive Strength, Sand Equivalent, & Flexural Strength reports 4, 5, 6, & 7. These reports detail each of the test elements by year and list all of the process information. The criteria for each report are listed in the report header.   Processes with less than three tests are excluded from these reports since no quality levels are calculated on these processes.   For each year, the best, worst, and weighted average are given for quality level, pay factor, I/DP, mean minus target value, standard deviation, and standard deviation minus the V factor. The mean to target value and standard deviation minus V factor calculations are important whenever evaluating the quality level for the process, see calculations.

Note – There were no flexural strength projects evaluated in 2004.

Note -   There is not a direct correlation between quality level and pay factor.   The calculations for pay factors are dependent on the number of tests and the quantity of material associated with each process.   A difference in the number of tests in two processes can result in a different calculation for pay factor even if the quality levels are the same. Please refer to the Revision to Sections 105, 106, and 412 for details on the calculations.

Note -   The best or worst results displayed do not necessarily come from the same process. The calculations for quality level and pay factor are dependent on the number of test results included in the process and vary slightly as the number of tests are changed.   Also, the calculation for quality level is dependent on both the standard deviation of the process and the mean for the process as it relates to the specification limits.   A small standard deviation does not necessarily mean a high quality level. Likewise, a larger standard deviation does not necessarily mean a lower quality level.

Project Data, report 8.   The Project Data report displays all of the QC/QA data reported for each project which had a start date in 2004.   The projects are sorted by subaccount.   Each project's data is detailed by test element and then process.   For each process the item, price, quantity, number of tests, quality level, pay factor, I/DP, mean, target value, mean minus target value, standard deviation, V factor, and standard deviation minus the V factor are given.   Project totals are given for each project.   For each element the number of tests, quantity, and I/DP are calculated.   The calculation for CPFC is detailed for each project.   This report contains all of the project's data and is the best report to review when concerned about an individual project.   All of a project's data may not be contained in other reports if that data does not meet that report's individual criteria.

6.0 DISCUSSION OF THE DATA

6.1 Projects Evaluated

Table 3 displays the number of projects and amount of material awarded and evaluated by bid date.   Table 4 displays the number of projects and amount of material evaluated by start date.   The start date is defined as the date on which the paving process began and is not the date the project was awarded to contract, bid date.   The paving on many of the projects began in the year after they were awarded to contract.   In a couple of instances the paving began in the second year.   Grouping the projects according to start date more accurately groups the projects together as to when they were constructed. The start date is used as the primary data grouping throughout this report.

Some of the projects included in this evaluation were constructed using SI metric units. In Tables 3 and 4 the amount of material is shown as a combination of units.   This was done to quickly present the quantity without having to do a conversion or display two separate values.   The data was converted to USA units in the calculated pay factor composite, thickness, compressive strength, sand equivalent, and flexural strength reports.

A relatively small number of projects are included in some of the data groupings. In three of the yearly evaluations only one project was included in the evaluation. Not too many conclusions should be made when the number of projects is small, less than five being a general rule. None of the yearly groupings for flexural strength contained more than four projects. In the years 2000 and 2002 only one project is evaluated. No flexural strength projects have been evaluated for 2004. Even though there is a somewhat limited amount of data for flexural strength a good evaluation of the specifications can be conducted. Additional project data will be added to the database as they are received by the Pavement Design Unit.

Table 3. Projects Evaluated by Bid Date

	Awarded			Evaluated/Criteria			
				Compressive Str.		Flexural Str.	
Year	Projects	SY/m2		Projects	SY/m2	Projects	SY/m2
2000	16	2,526,647		9	1,350,974	4	940,012
2001	11	1,907,658		7	356,832	2	789,433
2002	7	682,255		4	175,674	2	234,921
2003	11	814,345		3	124,369	1	39,431
2004	11	439,887		5	207,931	0	0

Table 4. Projects Evaluated by Start Date

	Compressive Str.		Flexural Str.	
Year	Projects	SY/m2	Projects	SY/m2
2000	3	357,612	1	197,453
2001	8	1,074,862	4	975,836
2002	6	311,376	1	556,156
2003	5	259,542	3	274,352
2004	5	206,830	0	0

6.2 Calculated Pay Factor Composite

The Calculated Pay Factor Composite (CPFC) information for the years 2000 through 2004 is displayed in Table 5. The information is first displayed separated by testing criteria, compressive strength or flexural strength. The information for all projects, both criteria combined, is displayed at the end of Table 5. The CPFC is an index of the overall quality of the PCCP based on the test results in the test elements. A CPFC above 1.0 indicates that an incentive payment was paid for the PCCP. A CPFC below 1.0 shows that a disincentive was applied to the pavement. The average incentive payment is above 3.8% in each year. Over the five-year time period the average is above 3.9%. All projects evaluated beginning in 2000 received some amount of incentive payment, CPFC greater than 1.0, for the PCCP. The lowest reported CPFC was 1.00618 in 2001. Of the 36 projects evaluated 19 received incentive payments greater than 4%. Two of these projects received the maximum incentive of 5%, see report 2, Appendix A for additional information. The average CPFC for each year, 2000 through 2004, is displayed in Figure 1. Figure 2 displays the yearly average and the calculated trendline. Over the five-year time period the CPFC has remained constant at 1.0409.

Table 5. Calculated Pay Factor Composite

Compressive Strength

			Calculated Pay Factor Composite		
Year	Projects	SY	Weighted Average	Minimum	Maximum
2000	3	411,488	1.04032	1.02665	1.04915
2001	8	1,137,320	1.03527	1.00618	1.04995
2002	6	335,970	1.04288	1.02543	1.05000
2003	5	276,825	1.04576	1.01008	1.04999
2004	5	211,847	1.03980	1.02905	1.04927
2000 - 2004	27	2,373,449	1.03885	1.00618	1.0500

Flexural Strength

			Calculated Pay Factor Composite		
Year	Projects	SY	Weighted Average	Minimum	Maximum
2000	1	102,150	1.04386	1.04386	1.04386
2001	4	1,062,547	1.04145	1.03282	1.05000
2002	1	563,201	1.04324	1.04324	1.04324
2003	3	276,188	1.02986	1.01668	1.03869
2004	0	--	--	--	--
2000 - 2004	9	2,004,086	1.04048	1.01668	1.05000

All Projects

			Calculated Pay Factor Composite		
Year	Projects	SY	Weighted Average	Minimum	Maximum
2000	4	513,638	1.04103	1.02665	1.04915
2001	12	2,199,867	1.03826	1.00618	1.05000
2002	7	899,171	1.04311	1.02543	1.05000
2003	8	533,013	1.03782	1.01008	1.04999
2004	5	211,847	1.03980	1.02905	1.04927
2000 to 2004	36	4,377,536	1.03960	1.00618	1.05000
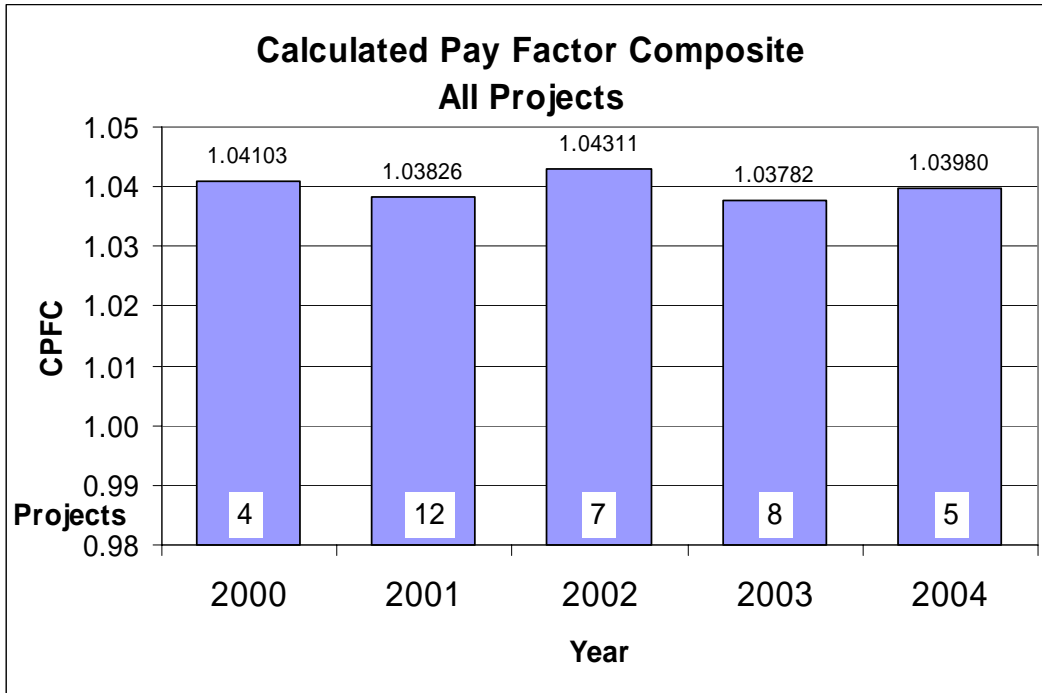
Figure 1. Calculated Pay Factor Composite by Year
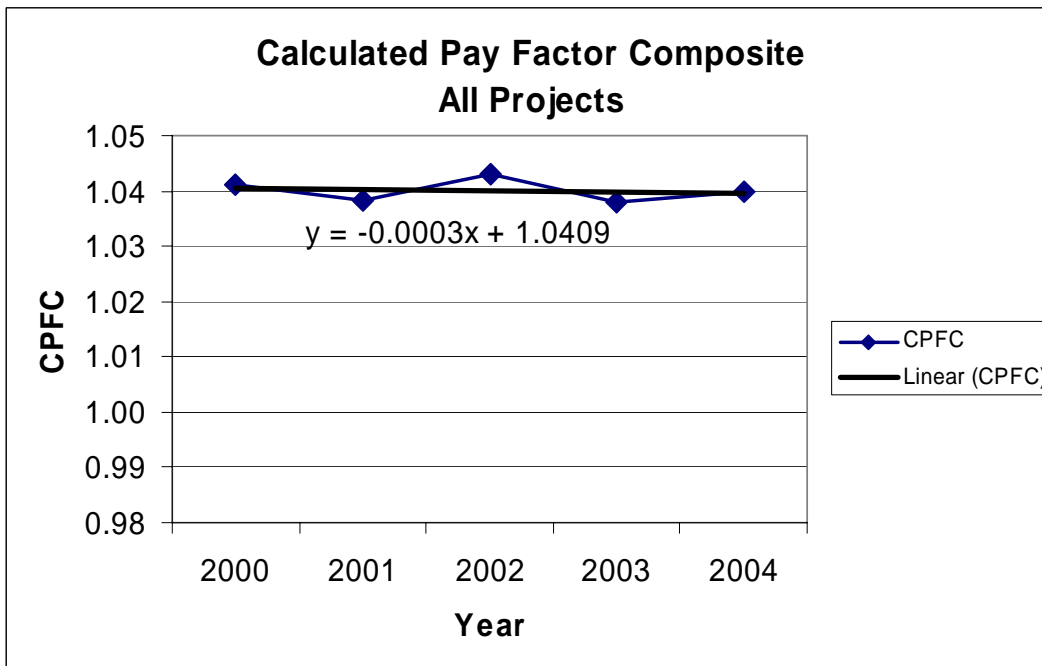
Figure 2. Calculated Pay Factor Composite with Trendline

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6.3 Incentive/Disincentive Payments

A recap of the Incentive/Disincentive Payments for the years 2000 through 2004 is presented in Table 6; additional information is presented in report 2, Appendix A. Every project evaluated received some amount of incentive payment. The average incentive has been just slightly under 4% over the five-year time period. The average size of the projects reported in 2003 and 2004 is significantly smaller than those reported in the first three years. The calculation for I/DP is directly tied to the size of the project, CPFC times quantity. This accounts for the smaller I/DPs reported in 2003 and 2004. The I/DP is important when evaluating the projects but a better way to evaluate the quality of the PCCP is to evaluate the CPFC and element quality levels.

Table 6. Incentive/Disincentive Payments – Recap by Year

		Square Yards		Incentive/Disincentive Payment			
Year	Projects	Total	Average	Summation	Average	Minimum	Maximum
2000	4	513,638	128,409	$554,571.76	$138,642.94	$53,400.73	$276,907.26
2001	12	2,199,867	183,322	$2,036,956.43	$169,746.37	$15,464.53	$441,429.80
2002	7	899,171	128,453	$1,062,641.83	$151,805.98	$43,617.66	$634,618.54
2003	8	553,013	69,127	$549,222.24	$68,652.78	$3,772.66	$213,295.38
2004	5	211,847	42,369	$252,094.50	$50,418.90	$27,575.51	$83,043.07
'00 to '04	36	4,377,536	121,598	$4,455,486.76	$123,763.52	$3,772.66	$634,618.54

6.4 Recap of Data 2000 through 2004 - Thickness, Compressive Strength, Sand Equivalent, & Flexural Strength

The results for each of the test elements for the years 2000 through 2004 are listed in Table 7. The quality level, pay factor, and standard deviation are shown for each element. The mean to target value and standard deviation minus V factor are also calculated. The mean to target value calculation shows the relationship between the mean for the test results in comparison to the target value for the element. Negative numbers indicate that the mean is below the target value. Positive values show that the

mean is above the target value. The higher the calculated value the better as it shows that the mean is moving farther away from the lower specification limit increasing the likelihood that more of the material will be within specification limits. The standard deviation minus V factor shows the comparison of the standard deviation for the test results to the historical standard deviation, the V factor. A negative number indicates that the standard deviation for the test results is smaller than the historical values. Positive values show that the process standard deviations have exceeded the historical values.

A very high percentage of the material being produced is within specification limits, quality levels approaching 100. Of the twenty data groupings used, year and test element, only two have an average that is less than 98% within specification limits. The lowest reported value is 97.838 in the compressive strength element for 2004, which is still very high. All of the average pay factors are above the 1.0 mark signifying that on average incentives have been paid on those elements. Many of the element pay factors are approaching the maximum allowable values: thickness 2%, compressive strength 2%, sand equivalent 1%, & flexural strength 3%. The mean to TV column shows that the material being produced is above the target value for the elements, positive values. Negative values in this column would indicate that the mean is below the element's target value, closer to the lower specification limits. All of the test elements used for testing PCCP only have a lower specification limit so none of the material can be out on the upper end. Being above the target value increases the likelihood that more of the material will be within specification limits. All of the values in the mean to TV column are positive, means above the target value. For each year in the compressive strength element the mean is greater than 1V above the target value. The means for this element far exceed the specification limits. The material being produced is well above the target value allowing almost 100% to be within the specification limits. When analyzing the standard deviations for the test elements we find that most of the material being produced is below the variation of the historical data, shown as negative values in the St. Dev. minus V column. Except for in the compressive strength element all of the values in the standard deviation minus V column are negative. In the compressive

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strength element the values are just slightly above the V value. The variation in this element is slightly above the historical values. However, this element has the best results in the mean to target value calculation, which allows a high percentage of the material to be within specification limits even with a slightly greater variance. Figures 3 through 10 display the quality levels and pay factors for each of the elements.

Table 7. Recap of Yearly Data by Test Element

Thickness									
Year	Proj.	SY	Tests	Quality Level	Pay Factor	Mean to TV	St. Dev.	V	St. Dev. - V
2000	4	500,108	176	98.790	1.01636	0.252	0.343	0.400	-0.057
2001	12	2,136,138	764	97.899	1.01139	0.155	0.350	0.400	-0.050
2002	7	873,914	339	98.745	1.01662	0.235	0.362	0.400	-0.038
2003	8	551,015	255	98.509	1.01430	0.231	0.354	0.400	-0.046
2004	5	211,847	88	99.727	1.01922	0.376	0.302	0.400	-0.098
					Max 1.02				
Compressive Strength									
Year	Proj.	SY	Tests	Quality Level	Pay Factor	Mean to TV	St. Dev.	V	St. Dev. - V
2000	3	391,323	72	98.580	1.01653	1,050	421	400	21
2001	8	1,124,612	433	99.906	1.01978	936	426	400	26
2002	6	340,823	127	99.826	1.01962	1,133	518	400	118
2003	5	262,087	145	99.815	1.01960	893	363	400	-37
2004	5	211,847	105	97.838	1.01238	536	465	400	65
					Max 1.02				
Sand Equivalent									
Year	Proj.	SY	Tests	Quality Level	Pay Factor	Mean to TV	St. Dev.	V	St. Dev. - V
2000	3	376,434	81	99.999	1.01000	2.77	2.360	4.000	-1.640
2001	8	1,120,825	415	98.861	1.00711	4.74	2.114	4.000	-1.886
2002	6	270,823	101	99.818	1.00974	7.08	2.062	4.000	-1.938
2003	5	273,401	150	99.765	1.00975	4.07	2.093	4.000	-1.907
2004	5	211,847	115	99.147	1.00847	2.11	2.046	4.000	-1.954
					Max 1.01				

					Flexural Strength				
Year	Proj.	SY	Tests	Quality Level	Pay Factor	Mean to TV	St. Dev.	V	St. Dev. - V
2000	1	99,735	51	99.089	1.02524	16.1	39.966	50.000	-10.034
2001	4	1,029,489	161	99.596	1.02827	45.2	38.340	50.000	-11.660
2002	1	546,334	237	99.982	1.02991	59.1	38.279	50.000	-11.721
2003	3	261,650	103	98.452	1.02077	11.2	44.446	50.000	-5.554
2004	0	--	--	--	--	--	--	--	--
					Max 1.03				
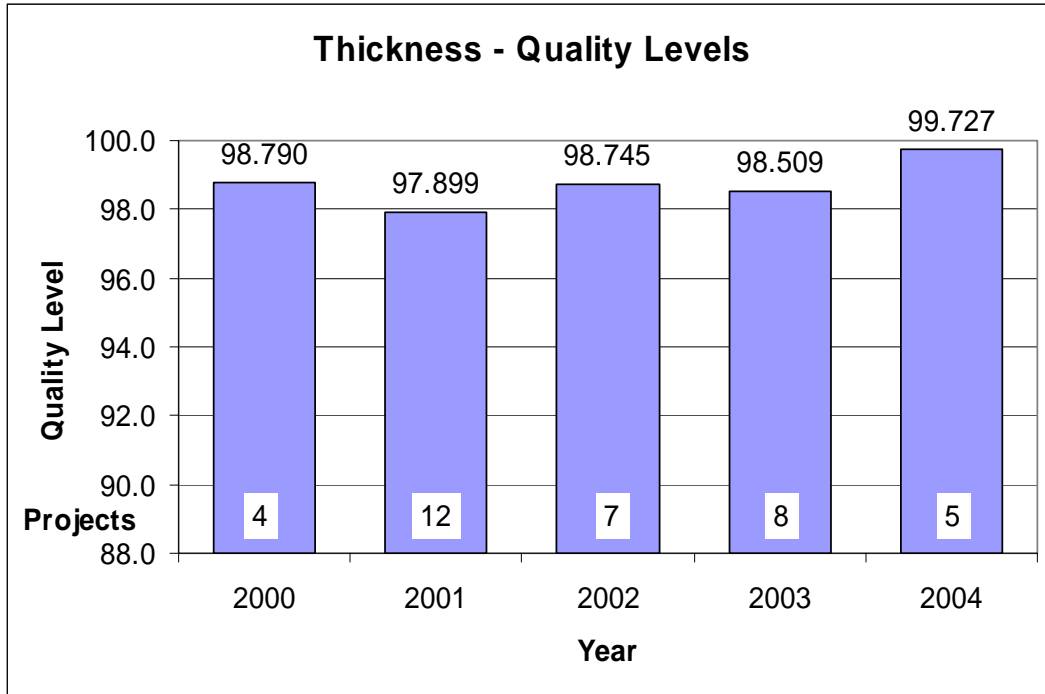
Figure 3. Thickness Quality Levels
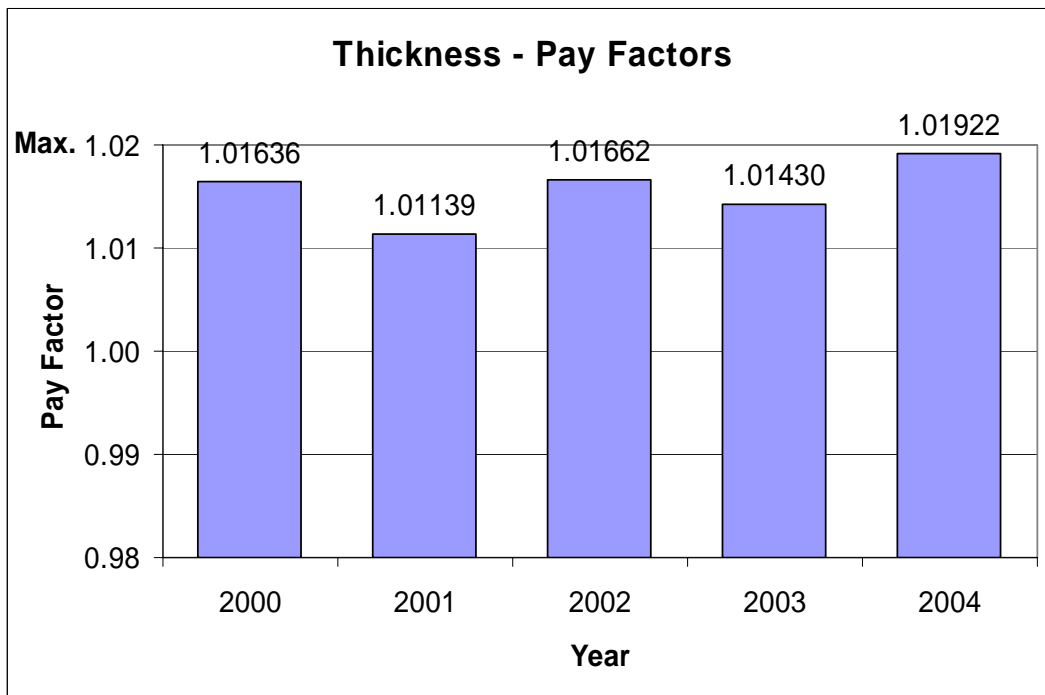
Figure 4. Thickness Pay Factors

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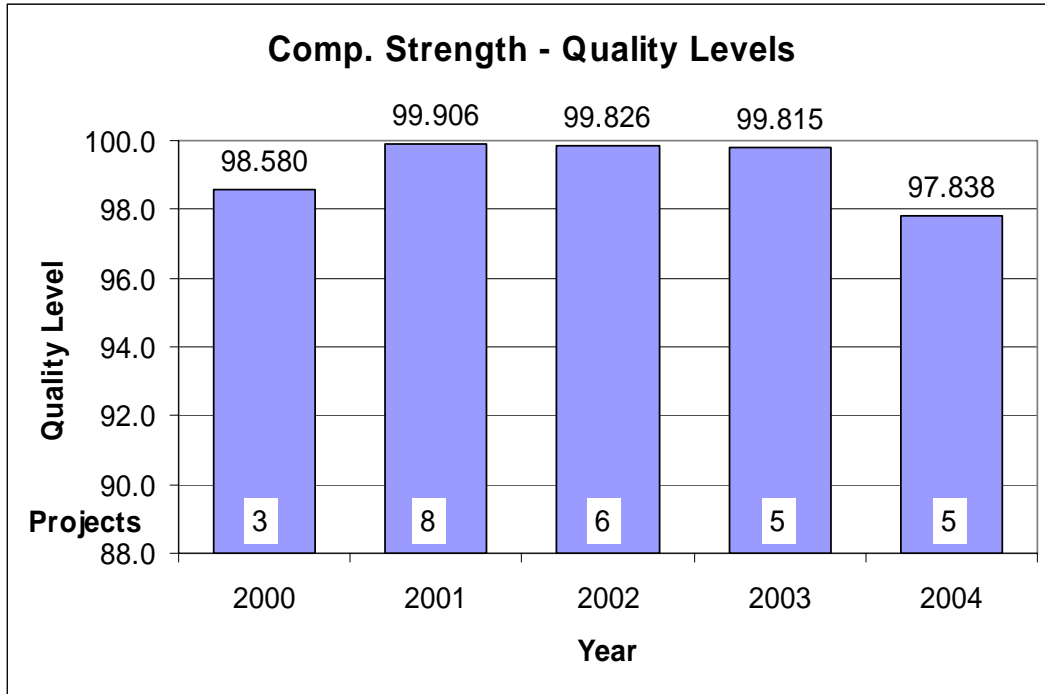
Figure 5. Compressive Strength Quality Levels

Figure 6. Compressive Strength Pay Factors
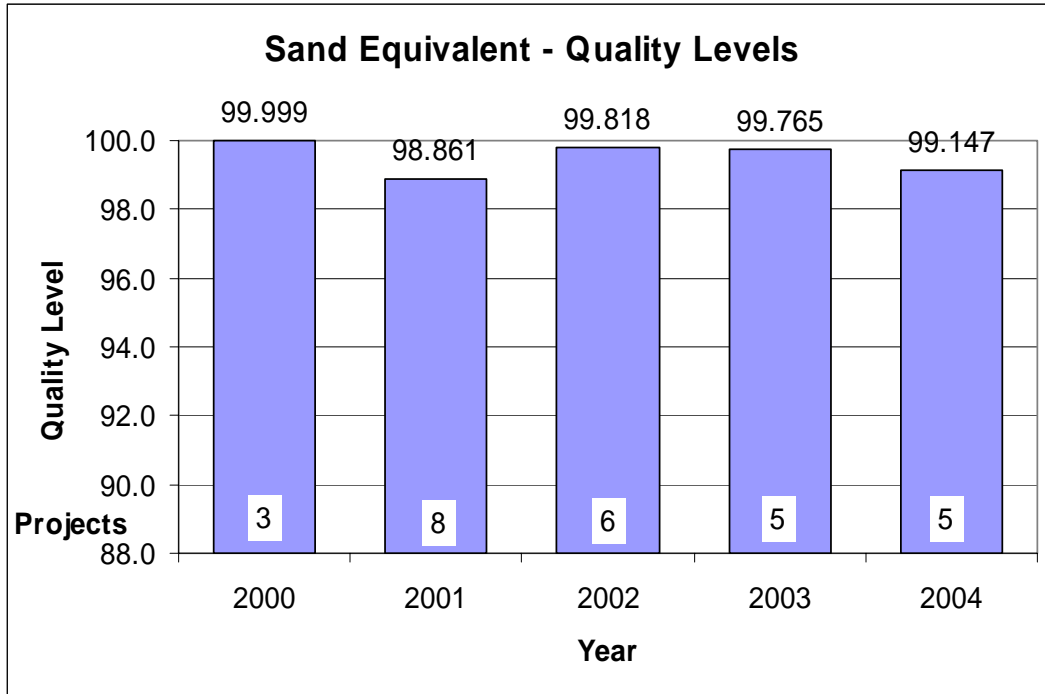
Figure 7. Sand Equivalent Quality Levels
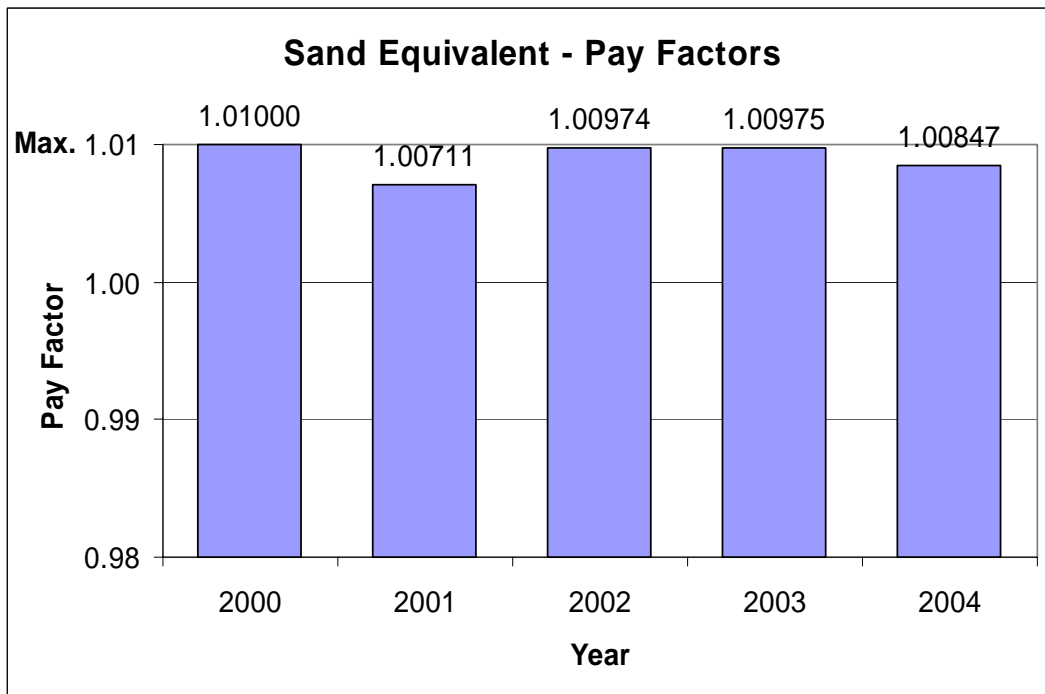
Figure 8. Sand Equivalent Pay Factors

Note: No flexural strength projects have been reported for 2004.

Flexural Strength - Quality Levels
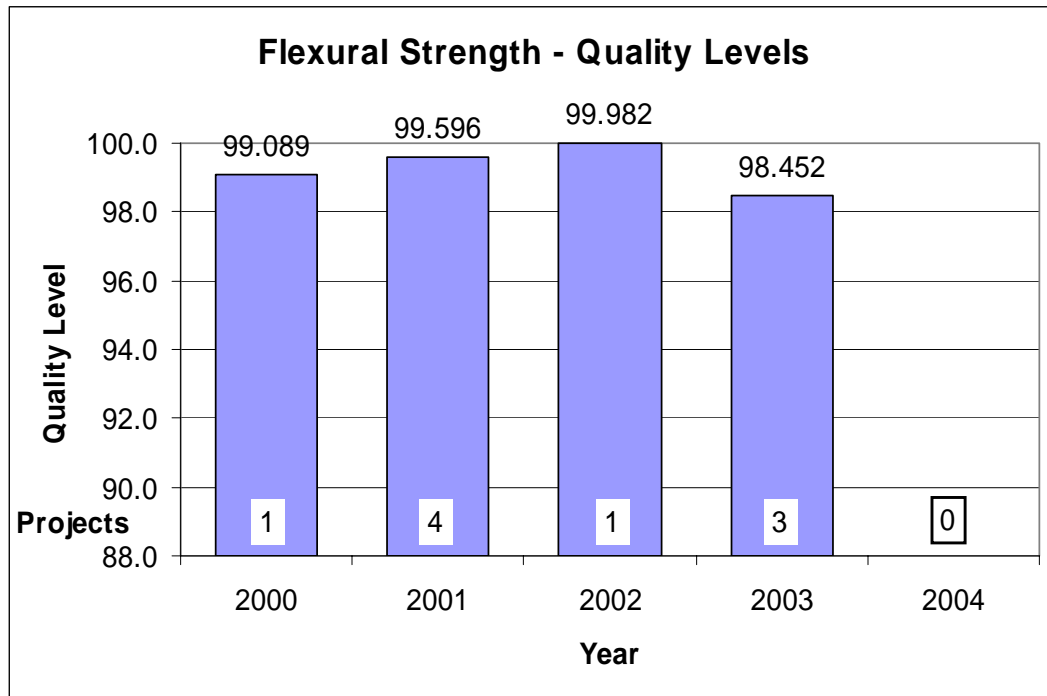
Figure 9. Flexural Strength Quality Levels

Flexural Strength - Pay Factors
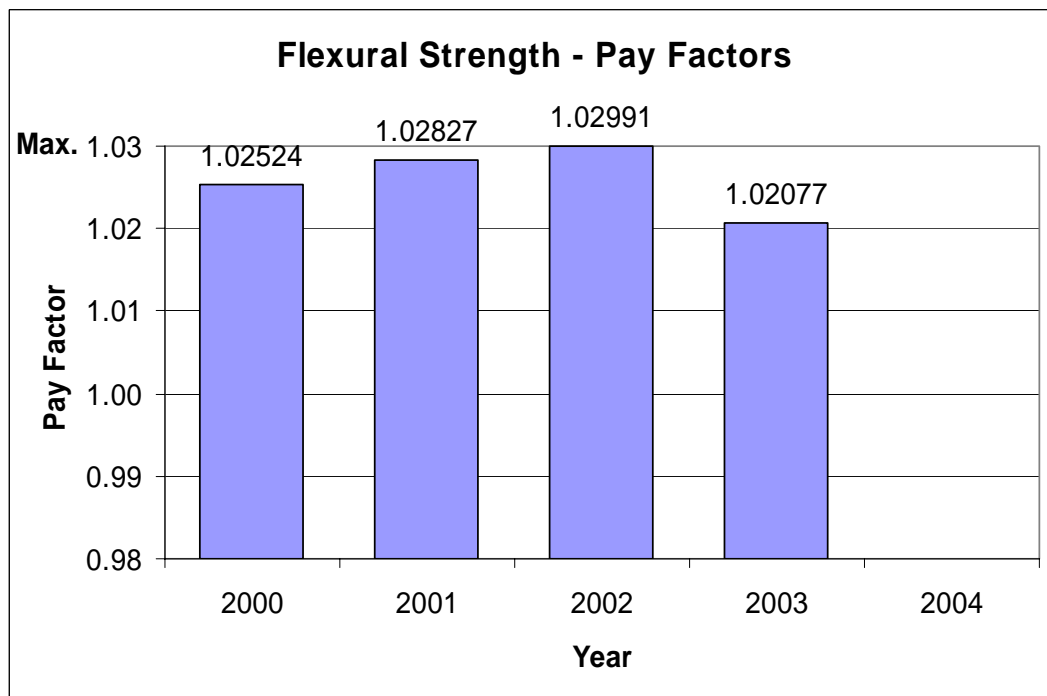
Figure 10. Flexural Strength Pay Factors

6.5 Test Element Quality Levels 2000 through 2004

Table 8 displays the average quality levels for each year for each of the test elements. The five-year average is also calculated for each of the elements. Figure 11 plots the yearly results for each of the elements. No unique distinguishing patterns can be found for any of the elements when reviewing this graph. The element quality levels overlap each other and cross other elements numerous times. The difference between the quality levels of the individual elements is very small. All of the quality levels are within a small range of values at a very high level, slightly below 98% to almost 100% in specification limits. The quality levels of the elements are not distinctly gapped. No one test element has significantly lower quality levels than any of the others. The five-year average for each of the elements is displayed in Figure 12. Again we see that the quality levels are at very high levels. The lowest reported value is 98.345 in the thickness element. All of the other elements have an average quality level above 99% within specification limits. The yearly quality levels and the calculated trendlines are displayed for the elements in Figures 13 and 14. The calculated slopes for the sand equivalent and compressive strength elements are negative but the value is quite small. The slope indicates a slight decrease but is essentially flat. The slope for the thickness element at 0.25 is the steepest of any of the elements and shows a slight improvement. A limited number of projects comprise the flexural strength element. Only one project is included in the evaluations for 2000 and 2002. No projects have been evaluated for 2004. Three and four projects were evaluated in 2001 and 2003 respectively. The limited number of projects is not good for trend predictions. The quality levels in this element are maintaining very acceptable levels with an average above 99.5% within specification. All of the test element quality levels are essentially at a constant level, only showing slight movement.   The percent within specification limits is at a very high percentage, above 98%.

Table 8. Quality Levels by Test Element

Year	Thickness Projects	Thickness QL	Comp. Str. Projects	Comp. Str. QL	Sand Equiv. Projects	Sand Equiv. QL	Flex. Str. Projects	Flex. Str. QL
2000	4	98.790	3	98.580	3	99.999	1	99.089
2001	12	97.899	8	99.906	8	98.861	4	99.596
2002	7	98.745	6	99.826	6	99.818	1	99.982
2003	8	98.509	5	99.815	5	99.765	3	98.452
2004	5	99.727	5	97.838	5	99.147	0	--
00-04	36	98.345	27	99.473	27	99.303	9	99.524
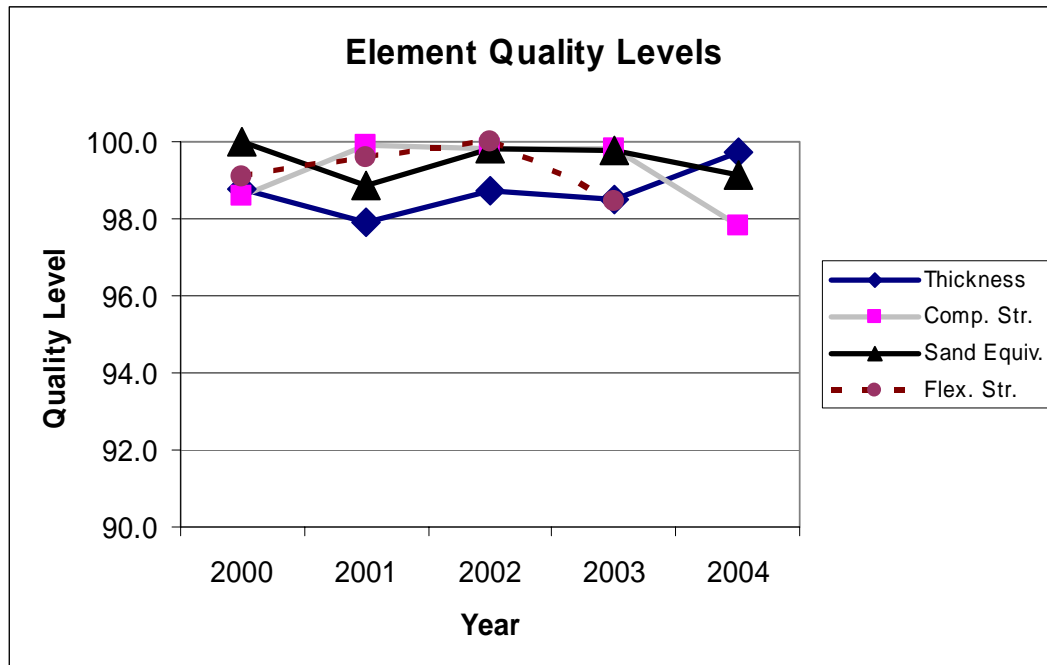
Figure 11. Quality Levels by Test Element

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Element Quality Levels
2000 through 2004
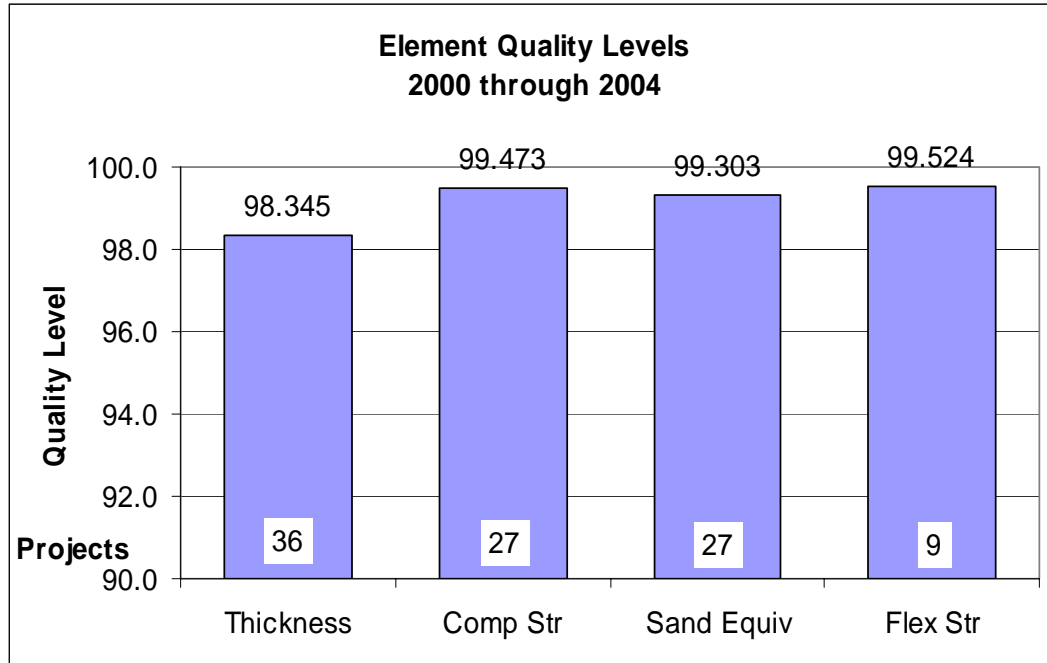
Figure 12. Quality Levels by Test Element 2000 through 2004
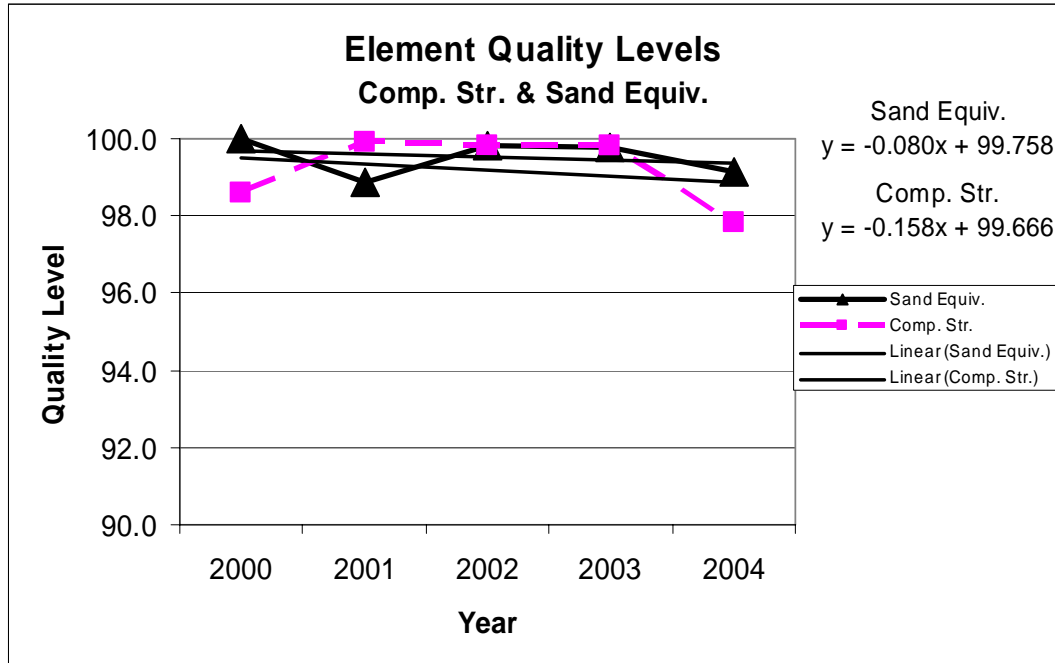
Figure 13. Compressive Strength & Sand Equivalent with Trendline
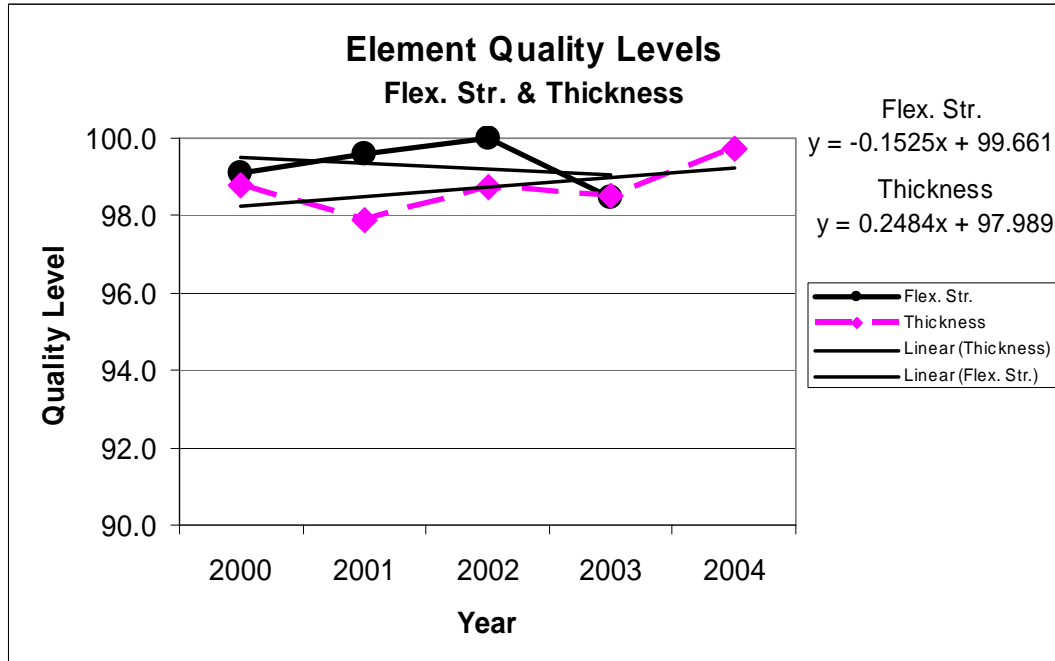
Figue 14. Thickness & Flexural Strength with Trendline

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6.6 Process Information by Year Reports, 2000 through 2004

Additional information on the calculations presented previously in this report can be found in the reports contained in Appendix A. A listing of projects for each year is contained in report 1. Additional project information can be found in this report. The Calculated Pay Factor Composite and Incentive/Disincentive Payment information for each project is detailed in reports 2 and 3. The weighted average is calculated for CPFC and the average I/DP for all of the projects are displayed. The maximum and minimum values are also shown. The totals for each year are also calculated. A detailed report for each of the test elements is also contained in Appendix A, reports 4 to 7. The process information for each of the test elements used in the evaluation is detailed by year. The weighted average is calculated for quality level, pay factor, I/DP, mean to target value, standard deviation, and standard deviation minus V factor. The best and worst result is also given for each of the evaluations.

Note - The best or worst results displayed in the reports do not necessarily come from the same process. The calculations for quality level and pay factor are dependent on the number of test results included in the process and vary slightly depending on the number of tests.   Also, the calculation for quality level is dependent on both the standard deviation of the process and the mean for the process as it relates to the specification limits. A small standard deviation does not necessarily mean a high quality level.   Likewise, a larger standard deviation does not necessarily mean a lower quality level.

6.7 Project Data for 2004

Appendix B contains report 8, Project Data, which details all of the test data for each project with a start date of 2004. The projects are sorted by subaccount. Each project's data is sorted by test element and then by process number. This is the only report which contains all of a project's data. All of a project's data may not be contained in other reports if that data does not meet that report's individual criteria. The calculation of CPFC is detailed for each project in the Project Data report.   This report is the best report to review when concerned about any single project.

7.0 SUMMARY

The PCCP on the projects evaluated from 2000 through 2004 have shown good test results. The average incentive payment is above 3.8% in each of the years. Over the five-year time period the average is above 3.9%, maximum incentive being 5%. All projects evaluated received some amount of incentive payment for the PCCP. The lowest reported CPFC was 1.00618 in 2001. Of the 36 projects evaluated 19 received incentive payments greater than 4%. Two of these projects received the maximum incentive of 5%. Over the five-year time period the CPFC has remained at a constant level.

When evaluating each of the test elements we find that of the twenty data groupings used, year and test element, only two of these have an average quality level that is less than 98% within specification limits. The lowest reported value is 97.838 in the compressive strength element for 2004, which is still very high. All of the average pay factors for the elements are above the 1.0 mark signifying that on average incentives have been paid on those elements. Many of the pay factors for the individual elements are approaching the maximum allowable values: thickness 2%, compressive strength 2%, sand equivalent 1%, & flexural strength 3%. The five year averages being: thickness 1.0138, compressive strength 1.0185, sand equivalent 1.0084, & flexural strength 1.0276. Two factors affect the quality level calculations, the mean for the process in relationship to the target value and the standard deviation of the process in comparison to the V value. The mean to TV calculations show that the material being produced is above the target value for the elements. Having a mean above the target value increases the likelihood that more of the material will be within specification limits. All of the average values in the mean to TV calculations are positive. For each year in the compressive strength element the mean is greater than 1V above the target value. The means for this element far exceed the specification limits. Overall the material being produced is well above the target value allowing almost 100% to be within the specification limits. When analyzing the standard deviations for the test elements we find that most of the material being produced is below the variation of the historical data, negative values in the standard deviation minus V calculations. The exception to this is in the compressive strength element which has values just slightly above the V values. The variation in this element is slightly above the historical values. However, this element has

the best results in the mean to target value calculation which allows a high percentage of the material to be within specification limits even with a slightly greater variance.

All of the average yearly quality levels for the elements are within a small range of values at a very high level, just slightly below 98% to almost 100% within specification. The results for all of the test elements are tightly grouped. The elements' five-year average quality levels are at very high levels. The lowest reported value is 98.345 in the thickness element. All of the other elements have an average quality level above 99% within specification.   The results for each of the elements show that the quality levels are at a constant level as shown by the calculated trendlines.   There is only a slight calculated decrease in the sand equivalent and compressive strength elements. The slope for these elements is essentially flat. The slope for the thickness element at 0.25 does show a slight improvement. A limited number of projects comprise the flexural strength element. Only one project is included in the evaluations for 2000 and 2002. No projects have been evaluated for 2004. Three and four projects were evaluated in 2001 and 2003 respectively.   The quality levels in this element are maintaining very acceptable levels with an average above 99.5% within specification. All of the element quality levels are essentially remaining at constant levels, only sight movement indicated.   The percent within specification limits is at a very high percentage, above 98%.

8.0 UPDATES AND CONTACT

The QC database will be updated as additional project data is received. Project data that was received after the cut-off date was not able to be included in this report. If you have any questions concerning this report please contact Eric Chavez at 303 757-9308, Eric.Chavez@dot.state.co.us. If you find any errors in the project data please report them to Eric Chavez.

REFERENCES

Standard Recommended Practice for *Acceptance Sampling Plans for Highway Construction*, AASHTO Designation: R9-97 (2000)

Colorado Procedure 71-01, Standard Practice for Determining Quality Level (Percent Within Tolerance Limits).

Portland Cement Concrete Pavement Review of QC/QA Data 2000 through 2003, (January 2005, Eric Chavez, Colorado Department of Transportation, 4201 East Arkansas Ave, Denver, CO 80222), Report No. CDOT-DTD-R-2005-9.

URLs

CDOT Library: http://www.dot.state.co.us/Publications/Library.htm
CDOT Standard Special Provisions:
http://www.dot.state.co.us/DesignSupport/Construction/2005SpecsBook/2005SSP/2005_SSP_Index.htm
CDOT Field Materials Manual:
http://www.dot.state.co.us/DesignSupport/Field%20Materials%20Manual/2006/Field%20Material%20Manual.htm
CDOT Application Software: http://www.dot.state.co.us/ecsu/Products.asp

Appendix A

Reports for Project Data 2000 through 2004

Project Listing by Year/Subaccount

Criteria: Projects with Start Dates from 1/1/2000 to 12/31/2004.

Quantity displayed in original units

2000

Subacct.	Bid Date	Start Date	Test Criteria	Reg.	Project Code	Location	Plan Quant	Units	Supplier
11849	05/04/00	09/18/00	Flex	1	IM 0704-184	I-70, Byers - East	197,453	USA	12
12317	03/23/00	10/30/00	Comp	2	NH 2872-012	Wiley Jct - East	204,138	SI	5
12541	06/29/00	10/20/00	Comp	6	SP 2254-062	I-225 & Parker, Phase III	93,509	SI	9
12583	01/27/00	06/09/00	Comp	2	IM 0251-155	SH 50/SH47/I-25 Intercha	59,965	SI	13

Compressive Strength:	3	Units, USA:	1	Compressive:	357,612
Flexural Strength:	1	SI:	3	Flexural:	197,453
Total:	4			Total Plan Quantity:	555,065

2001

Subacct.	Bid Date	Start Date	Test Criteria	Reg.	Project Code	Location	Plan Quant	Units	Supplier
11848	08/10/00	09/26/01	Flex	1	NH 2854-068	Foxton Rd to Eagle	170,717	USA	11
11985	11/30/00	04/27/01	Flex	4	STA C370-004	US 6 & 385 Phillips	278,806	USA	14
12056	08/31/00	06/06/01	Comp	6	IMB 0761-172	I-76 & 120 th Ave	133,999	SI	15
12379	04/26/01	07/27/01	Comp	6	STU 2254-060	Iliff and I-225	8,856	USA	7
12489	05/24/01	08/27/01	Flex	1	C 0405-023	Jct SH 94 East & West	233,277	USA	5
12542	07/20/00	07/14/01	Comp	6	IM 0704-191	I-70 Washington to Bright	30,502	SI	22
12636	06/15/00	03/29/01	Flex	1	IM 0252-324	I-25 Climb Lanes	293,036	Si	5
12644	10/26/00	07/06/01	Comp	4	IM 0761-041	I-76 Sterling to Atwood	440,682	USA	12
12847	09/28/00	07/20/01	Comp	4	NH 2873-104	US 287 s/o SH 60 to 402	130,901	USA	10
13210	12/14/00	05/22/01	Comp	6	STA 1211-053	SH 121 C-470 to Parkhill	148,556	USA	5
13390	01/11/01	06/22/01	Comp	2	IM 0252-342	I-25 Nevada/Tejon	72,644	SI	11
93222	04/20/00	04/06/01	Comp	6	IM 2706-030	270 Phases II & III	108,722	USA	7

Compressive Strength:	8	Units, USA:	8	Compressive:	1,074,862
Flexural Strength:	4	SI:	4	Flexural:	975,836
Total:	12			Total Plan Quantity:	2,050,698

2002

Subacct.	Bid Date	Start Date	Test Criteria	Reg.	Project Code	Location	Plan Quant	Units	Supplier
11925	08/30/01	08/19/02	Flex	4	IM 0253-151	I-25, SH 7 to WCR 16	556,156	USA	15
12390	08/16/01	04/19/02	Comp	2	IM 0851-002	SH 85 Fountain Int	26,705	USA	15
12614	07/26/01	02/02/02	Comp	6	NH 0831-080	SH 83 Hampden to I-225	39,288	SI	9
12638	05/31/01	06/28/02	Comp	6	C 2706-031	SH 270 Phase IV	35,985	USA	7
13275	09/06/01	04/05/02	Comp	6	IM 0761-182	I-76 & 96th Ave.	63,819	USA	10
13294	08/09/01	05/22/02	Comp	1	NH 0831-084	SH 83 Whitetopping	109,535	USA	10
13573	04/18/02	09/08/02	Comp	6	NH 2254-064	Iliff and I-225	36,044	USA	9

Compressive Strength:	**6**	**Units, USA:**	**6**	**Compressive:**	**311,376**
Flexural Strength:	**1**	**SI:**	**1**	**Flexural:**	**556,156**
Total:	**7**			**Total Plan Quantity:**	**867,532**

2003

Subacct.	Bid Date	Start Date	Test Criteria	Reg.	Project Code	Location	Plan Quant	Units	Supplier
13278	12/12/02	04/29/03	Comp	6	STA 2873-112	SH 287 (Federal)	18,903	USA	10
13344	07/24/03	10/25/03	Comp	6	IM 0253-168	I-25 HOV Gates	17,899	USA	12
13480	06/27/02	06/30/03	Comp	2	IM 0252-347	I-25 @ Monument Inter	111,318	SI	11
13529	07/25/02	08/29/03	Flex	4	STU 1192-011	Ken Pratt Blvd	157,674	USA	12
13804	08/01/02	10/08/03	Comp	6	IM 0252-354	I-25/Broadway Viaduct	9,409	USA	9
13831	10/10/02	06/19/03	Flex	6	IM 0761-184	I-76 @ 88th Ave	77,247	USA	12
13858	02/20/03	07/28/03	Comp	6	STA 1211-056	104th & Wadsworth	102,013	USA	12
13897	02/27/03	08/27/03	Flex	1	NH 0852-088	US 85 - Sedalia	39,431	USA	17

Compressive Strength:	**5**	**Units, USA:**	**7**	**Compressive:**	**259,542**
Flexural Strength:	**3**	**SI:**	**1**	**Flexural:**	**274,352**
Total:	**8**			**Total Plan Quantity:**	**533,894**

2004

Subacct.	Bid Date	Start Date	Test Criteria	Reg.	Project Code	Location	Plan Quant	Units	Supplier
13885	06/03/04	09/18/04	Comp	3	NH 0821-064	Glenwood Springs	34,170	USA	20
13967	02/26/04	09/10/04	Comp	1	IM 0252-359	Castle Pines Interchange	48,418	USA	7
14242	02/26/04	08/14/04	Comp	6	STA 0831-089	SH 83 Arapahoe to Orcha	108,473	USA	5
14342	06/19/03	04/09/04	Comp	2	STA 012A-039	SH 12 Extension in Trinid	4,457	USA	11
14948	08/05/04	10/04/04	Comp	3	IM 0701-168	Rifle to Silt Slab Repair	11,312	USA	19

Compressive Strength: 5	**Units, USA:** 5	**Compressive:**	206,830
Flexural Strength: 0	**SI:** 0	**Flexural:**	0
Total: 5		**Total Plan Quantity:**	206,830

Totals: 1/1/2000 to 12/31/2004.

Compressive Strength: 27	**Units, USA:** 27	**Compressive:**	2,210,222
Flexural Strength: 9	**SI:** 9	**Flexural:**	2,003,797
Total: 36		**Total Plan Quantity:**	4,214,019

Calculated Pay Factor Composite and I/DP by Year

Criteria: Projects with Start Dates from 1/1/2000 to 12/31/2004.

PFC is back calculated from the Project's I/DP.

A Calculated Average Unit Price is used in the calculation.

2000	Subacct.	Bid Date	Start Date	Reg.	Test Criteria	Orig. Unit	Quantity	Quant. USA	Ave. Price	Price USA	CPFC	Project IDP
	12317	03/23/00	10/30/00	2	Comp	SI	206,382	246,831	$27.30	$22.83	1.04915	$276,907.26
	11849	05/04/00	09/18/00	1	Flex		102,150	102,150	$25.52	$25.52	1.04386	$114,488.88
	12583	01/27/00	06/09/00	2	Comp	SI	43,698	52,262	$38.27	$31.99	1.02804	$53,400.73
	12541	06/29/00	10/20/00	6	Comp	SI	93,976	112,394	$43.84	$36.65	1.02665	$109,774.89

	Number of Projects: 4		Total:	513,638	USA		Sum	$554,571.76
			Ave:	128,409	$27.32	Min.	1.02665	$53,400.73
						Max.	1.04915	$276,907.26
						Weighted Ave.		Average
							1.04103	$138,642.94

2001	Subacct.	Bid Date	Start Date	Reg.	Test Criteria	Orig. Unit	Quantity	Quant. USA	Ave. Price	Price USA	CPFC	Project IDP
	12489	05/24/01	08/27/01	1	Flex		232,911	232,911	$26.22	$26.22	1.05000	$305,316.23
	13210	12/14/00	05/22/01	6	Comp		155,409	155,409	$19.50	$19.50	1.04995	$151,378.90
	11848	08/10/00	09/26/01	1	Flex		171,047	171,047	$29.04	$29.04	1.04921	$244,413.18
	12644	10/26/00	07/06/01	4	Comp		439,889	439,889	$22.00	$22.00	1.04561	$441,429.80
	12379	04/26/01	07/27/01	6	Comp		8,856	8,856	$40.84	$40.84	1.04276	$15,464.53
	11985	11/30/00	04/27/01	4	Flex		288,305	288,305	$19.52	$19.52	1.04103	$230,921.84
	93222	04/20/00	04/06/01	6	Comp		114,585	114,585	$34.91	$34.91	1.03732	$149,290.22
	12542	07/20/00	07/14/01	6	Comp	SI	35,447	42,394	$44.87	$37.52	1.03587	$57,044.38
	12636	06/15/00	03/29/01	1	Flex	SI	309,605	370,284	$30.25	$25.29	1.03282	$306,074.51
	12847	09/28/00	07/20/01	4	Comp		130,376	130,376	$18.19	$18.19	1.03115	$73,873.03
	12056	08/31/00	06/06/01	6	Comp	SI	133,449	159,604	$32.59	$27.25	1.00953	$41,430.93
	13390	01/11/01	06/22/01	2	Comp	SI	72,080	86,207	$45.65	$38.17	1.00618	$20,318.88

	Number of Projects: 12		Total:	2,199,867	USA		Sum	$2,036,956.43
			Ave:	183,322	$24.88	Min.	1.00618	$15,464.53
						Max.	1.05000	$441,429.80
						Weighted Ave.		Average
							1.03826	$169,746.37

Calculated Pay Factor Composite and I/DP by Year

2002	Subacct.	Bid Date	Start Date	Reg.	Test Criteria	Orig. Unit	Quantity	Quant. USA	Ave. Price	Price USA	CPFC	Project IDP
	13275	09/06/01	04/05/02	6	Comp		63,347	63,347	$32.00	$32.00	1.05000	$101,346.69
	12638	05/31/01	06/28/02	6	Comp		34,871	34,871	$34.00	$34.00	1.04970	$58,924.49
	13294	08/09/01	05/22/02	1	Comp		105,000	105,000	$20.00	$20.00	1.04766	$100,084.14
	11925	08/30/01	08/19/02	4	Flex		563,201	563,201	$26.06	$26.06	1.04324	$634,618.54
	12390	08/16/01	04/19/02	2	Comp		26,360	26,360	$41.69	$41.69	1.03969	$43,617.66
	13573	04/18/02	09/08/02	6	Comp		60,000	60,000	$42.00	$42.00	1.03794	$77,016.21
	12614	07/26/01	02/02/02	6	Comp	SI	38,790	46,392	$47.67	$39.86	1.02543	$47,034.10

Number of Projects: 7 **Total:** 899,171 **USA** **Sum** $1,062,641.83
Ave: 128,453 $28.31 **Min.** 1.02543 $43,617.66
Max. 1.05000 $634,618.54
Weighted Ave. **Average**
1.04311 $151,805.98

2003	Subacct.	Bid Date	Start Date	Reg.	Test Criteria	Orig. Unit	Quantity	Quant. USA	Ave. Price	Price USA	CPFC	Project IDP
	13344	07/24/03	10/25/03	6	Comp		18,284	18,284	$38.77	$38.77	1.04999	$35,436.45
	13858	02/20/03	07/28/03	6	Comp		99,575	99,575	$14.35	$14.35	1.04929	$70,430.27
	13480	06/27/02	06/30/03	2	Comp	SI	111,177	132,967	$42.36	$35.42	1.04529	$213,295.38
	13278	12/12/02	04/29/03	6	Comp		16,609	16,609	$38.00	$38.00	1.04390	$27,708.11
	13831	10/10/02	06/19/03	6	Flex		92,389	92,389	$27.25	$27.25	1.03869	$97,410.14
	13529	07/25/02	08/29/03	4	Flex		137,704	137,704	$21.10	$21.10	1.02834	$82,355.03
	13897	02/27/03	08/27/03	1	Flex		46,095	46,095	$24.47	$24.47	1.01668	$18,814.20
	13804	08/01/02	10/08/03	6	Comp		9,390	9,390	$39.87	$39.87	1.01008	$3,772.66

Number of Projects: 8 **Total:** 553,013 **USA** **Sum** $549,222.24
Ave: 69,127 $26.05 **Min.** 1.01008 $3,772.66
Max. 1.04999 $213,295.38
Weighted Ave. **Average**
1.03782 $68,652.78

2004	Subacct.	Bid Date	Start Date	Reg.	Test Criteria	Orig. Unit	Quantity	Quant. USA	Ave. Price	Price USA	CPFC	Project IDP
	13885	06/03/04	09/18/04	3	Comp		31,097	31,097	$45.00	$45.00	1.04927	$68,948.60
	14948	08/05/04	10/04/04	3	Comp		10,580	10,580	$53.43	$53.43	1.04878	$27,575.51
	14342	06/19/03	04/09/04	2	Comp		13,600	13,600	$47.88	$47.88	1.04467	$29,090.63
	14242	02/26/04	08/14/04	6	Comp		107,775	107,775	$19.06	$19.06	1.04043	$83,043.07
	13967	02/26/04	09/10/04	1	Comp		48,795	48,795	$30.64	$30.64	1.02905	$43,436.69

Number of Projects: 5

Total:	211,847	USA	Sum	$252,094.50
Ave:	42,369	$29.10	Min. 1.02905	$27,575.51
			Max. 1.04927	$83,043.07
			Weighted Ave.	Average
			1.03980	$50,418.90

Totals: *1/1/2000 to 12/31/2004.*

	Quant. USA	Ave. Price	CPFC	IDP
Number of Projects: 36	Total: 4,377,536		Sum	$4,455,486.76
	Ave: 121,598	$26.22	Min. 1.00618	$3,772.66
			Max. 1.05000	$634,618.54
			Weighted Ave. 1.03960	$123,763.52

Calculated Pay Factor Composite and I/DP by Test Criteria and Year

Criteria: Projects with Start Dates from 1/1/2000 to 12/31/2004.

PFC is back calculated from the Project's I/DP.

A Calculated Average Unit Price is used in the calculation.

Compressive Strength

2000 Subacct.	Bid Date	Start Date	Reg.	Test Criteria	Orig. Unit	Quantity	Quant. USA	Ave. Price	Price USA	CPFC	Project IDP
12317	03/23/00	10/30/00	2	Comp	SI	206,382	246,831	$27.30	$22.83	1.04915	$276,907.26
12583	01/27/00	06/09/00	2	Comp	SI	43,698	52,262	$38.27	$31.99	1.02804	$53,400.73
12541	06/29/00	10/20/00	6	Comp	SI	93,976	112,394	$43.84	$36.65	1.02665	$109,774.89

		Number of Projects: 3				Total:	411,488		Min.	1.02665	$53,400.73
						Ave:	137,163		Max.	1.04915	$276,907.26
									Weighted Ave.		**Average**
									1.04032		$146,694.29

Compressive Strength

2001 Subacct.	Bid Date	Start Date	Reg.	Test Criteria	Orig. Unit	Quantity	Quant. USA	Ave. Price	Price USA	CPFC	Project IDP
13210	12/14/00	05/22/01	6	Comp		155,409	155,409	$19.50	$19.50	1.04995	$151,378.90
12644	10/26/00	07/06/01	4	Comp		439,889	439,889	$22.00	$22.00	1.04561	$441,429.80
12379	04/26/01	07/27/01	6	Comp		8,856	8,856	$40.84	$40.84	1.04276	$15,464.53
93222	04/20/00	04/06/01	6	Comp		114,585	114,585	$34.91	$34.91	1.03732	$149,290.22
12542	07/20/00	07/14/01	6	Comp	SI	35,447	42,394	$44.87	$37.52	1.03587	$57,044.38
12847	09/28/00	07/20/01	4	Comp		130,376	130,376	$18.19	$18.19	1.03115	$73,873.03
12056	08/31/00	06/06/01	6	Comp	SI	133,449	159,604	$32.59	$27.25	1.00953	$41,430.93
13390	01/11/01	06/22/01	2	Comp	SI	72,080	86,207	$45.65	$38.17	1.00618	$20,318.88

		Number of Projects: 8				Total:	1,137,320		Min.	1.00618	$15,464.53
						Ave:	142,165		Max.	1.04995	$441,429.80
									Weighted Ave.		**Average**
									1.03527		$118,778.83

Compressive Strength

2002 Subacct.	Bid Date	Start Date	Reg.	Test Criteria	Orig. Unit	Quantity	Quant. USA	Ave. Price	Price USA	CPFC	Project IDP
13275	09/06/01	04/05/02	6	Comp		63,347	63,347	$32.00	$32.00	1.05000	$101,346.69
12638	05/31/01	06/28/02	6	Comp		34,871	34,871	$34.00	$34.00	1.04970	$58,924.49
13294	08/09/01	05/22/02	1	Comp		105,000	105,000	$20.00	$20.00	1.04766	$100,084.14
12390	08/16/01	04/19/02	2	Comp		26,360	26,360	$41.69	$41.69	1.03969	$43,617.66
13573	04/18/02	09/08/02	6	Comp		60,000	60,000	$42.00	$42.00	1.03794	$77,016.21
12614	07/26/01	02/02/02	6	Comp	SI	38,790	46,392	$47.67	$39.86	1.02543	$47,034.10

Number of Projects: 6		**Total:**	335,970		**Min.**	1.02543	$43,617.66
		Ave:	55,995		**Max.**	1.05000	$101,346.69
					Weighted Ave.	**Average**
					1.04288	$71,337.22

Compressive Strength

2003 Subacct.	Bid Date	Start Date	Reg.	Test Criteria	Orig. Unit	Quantity	Quant. USA	Ave. Price	Price USA	CPFC	Project IDP
13344	07/24/03	10/25/03	6	Comp		18,284	18,284	$38.77	$38.77	1.04999	$35,436.45
13858	02/20/03	07/28/03	6	Comp		99,575	99,575	$14.35	$14.35	1.04929	$70,430.27
13480	06/27/02	06/30/03	2	Comp	SI	111,177	132,967	$42.36	$35.42	1.04529	$213,295.38
13278	12/12/02	04/29/03	6	Comp		16,609	16,609	$38.00	$38.00	1.04390	$27,708.11
13804	08/01/02	10/08/03	6	Comp		9,390	9,390	$39.87	$39.87	1.01008	$3,772.66

Number of Projects: 5		**Total:**	276,825		**Min.**	1.01008	$3,772.66
		Ave:	55,365		**Max.**	1.04999	$213,295.38
					Weighted Ave.	**Average**
					1.04576	$70,128.57

Compressive Strength

2004	Subacct.	Bid Date	Start Date	Reg.	Test Criteria	Orig. Unit	Quantity	Quant. USA	Ave. Price	Price USA	CPFC	Project IDP
	13885	06/03/04	09/18/04	3	Comp		31,097	31,097	$45.00	$45.00	1.04927	$68,948.60
	14948	08/05/04	10/04/04	3	Comp		10,580	10,580	$53.43	$53.43	1.04878	$27,575.51
	14342	06/19/03	04/09/04	2	Comp		13,600	13,600	$47.88	$47.88	1.04467	$29,090.63
	14242	02/26/04	08/14/04	6	Comp		107,775	107,775	$19.06	$19.06	1.04043	$83,043.07
	13967	02/26/04	09/10/04	1	Comp		48,795	48,795	$30.64	$30.64	1.02905	$43,436.69

Number of Projects: 5		**Total:**	211,847		**Min.**	1.02905	$27,575.51
		Ave:	42,369		**Max.**	1.04927	$83,043.07
					Weighted Ave.	**Average**
					1.03980	$50,418.90

Compressive Strength Totals

				CPFC	IDP
Number of Projects: 27	**Total:**	2,373,449	**Min.**	1.00618	$3,772.66
	Ave:	87,906	**Max.**	1.05000	$441,429.80
			Weighted Ave.	1.03885	$89,669.42

Flexural Strength

2000	Subacct.	Bid Date	Start Date	Reg.	Test Criteria	Orig. Unit	Quantity	Quant. USA	Ave. Price	Price USA	CPFC	Project IDP
	11849	05/04/00	09/18/00	1	Flex		102,150	102,150	$25.52	$25.52	1.04386	$114,488.88

Number of Projects: 1		**Total:**	102,150		**Min.**	1.04386	$114,488.88
		Ave:	102,150		**Max.**	1.04386	$114,488.88
					Weighted Ave.	**Average**
					1.04386	$114,488.88

Calculated Pay Factor Composite and I/DP by Test Criteria and Year

Flexural Strength

2001 Subacct.	Bid Date	Start Date	Reg.	Test Criteria	Orig. Unit	Quantity	Quant. USA	Ave. Price	Price USA	CPFC	Project IDP
12489	05/24/01	08/27/01	1	Flex		232,911	232,911	$26.22	$26.22	1.05000	$305,316.23
11848	08/10/00	09/26/01	1	Flex		171,047	171,047	$29.04	$29.04	1.04921	$244,413.18
11985	11/30/00	04/27/01	4	Flex		288,305	288,305	$19.52	$19.52	1.04103	$230,921.84
12636	06/15/00	03/29/01	1	Flex	SI	309,605	370,284	$30.25	$25.29	1.03282	$306,074.51

Number of Projects: 4			Total:	1,062,547		Min.	1.03282	$230,921.84
			Ave:	265,637		Max.	1.05000	$306,074.51
						Weighted Ave.		**Average**
							1.04145	$271,681.44

Flexural Strength

2002 Subacct.	Bid Date	Start Date	Reg.	Test Criteria	Orig. Unit	Quantity	Quant. USA	Ave. Price	Price USA	CPFC	Project IDP
11925	08/30/01	08/19/02	4	Flex		563,201	563,201	$26.06	$26.06	1.04324	$634,618.54

Number of Projects: 1			Total:	563,201		Min.	1.04324	$634,618.54
			Ave:	563,201		Max.	1.04324	$634,618.54
						Weighted Ave.		**Average**
							1.04324	$634,618.54

Flexural Strength

2003 Subacct.	Bid Date	Start Date	Reg.	Test Criteria	Orig. Unit	Quantity	Quant. USA	Ave. Price	Price USA	CPFC	Project IDP
13831	10/10/02	06/19/03	6	Flex		92,389	92,389	$27.25	$27.25	1.03869	$97,410.14
13529	07/25/02	08/29/03	4	Flex		137,704	137,704	$21.10	$21.10	1.02834	$82,355.03
13897	02/27/03	08/27/03	1	Flex		46,095	46,095	$24.47	$24.47	1.01668	$18,814.20

Number of Projects: 3			Total:	276,188		Min.	1.01668	$18,814.20
			Ave:	92,063		Max.	1.03869	$97,410.14
						Weighted Ave.		**Average**
							1.02986	$66,193.12

Flexural Strength Totals

				CPFC	IDP
Number of Projects: 9	Total:	2,004,086	Min.	1.01668	$18,814.20
	Ave:	222,676	Max.	1.05000	$634,618.54
			Weighted Ave.	1.04048	$226,045.84

Totals: *1/1/2000 to 12/31/2004.*					**CPFC**	**IDP**
Number of Projects: 36	**Total:**	4,377,536		**Min.**	1.00618	$3,772.66
	Ave:	121,598		**Max.**	1.05000	$634,618.54
			Weighted Ave.		1.03960	$123,763.52

Thickness, Process Information by Year

Criteria: Projects with Start Dates from   1/1/2000 to 12/31/2004.

Processes with less than 3 tests not included.

2000 Thickness

TV = PT + (0.65 * V)

Subacct.	Item (inch)	Orig. Unit	Price	Quant SY	Tests	Quality Level	Pay Factor	I/DP	Mean	TV	X - TV	St. Dev.	V	Std Dev - V
11849	8.00	USA	$48.82	2,665	4	100.000	1.02000	$2,601.46	8.158	8.260	-0.102	0.189	0.400	-0.211
11849	13.00	USA	$25.53	36,620	12	100.000	1.02000	$18,697.24	13.678	13.260	0.418	0.284	0.400	-0.116
12583	8.27	SI	$34.40	2,034	3	100.000	1.02000	$1,170.00	8.596	8.530	0.066	0.150	0.400	-0.250
12317	10.83	SI	$27.30	3,999	4	100.000	1.02000	$1,825.37	10.999	11.090	-0.091	0.168	0.400	-0.232
12541	12.40	SI	$48.80	10,885	3	100.000	1.02000	$8,880.36	12.598	12.660	-0.062	0.170	0.400	-0.230
12317	10.83	SI	$27.30	3,999	4	100.000	1.02000	$1,825.37	11.491	11.090	0.401	0.186	0.400	-0.214
12541	10.43	SI	$36.30	24,584	7	100.000	1.02000	$14,922.93	11.094	10.690	0.404	0.218	0.400	-0.182
12317	10.83	SI	$27.30	3,999	4	100.000	1.02000	$1,825.37	11.541	11.090	0.451	0.305	0.400	-0.095
12583	10.83	SI	$38.00	5,937	4	100.000	1.02000	$3,771.70	10.999	11.090	-0.091	0.372	0.400	-0.028
12541	10.43	SI	$49.50	25,519	7	100.000	1.02000	$21,123.63	11.164	10.690	0.474	0.372	0.400	-0.028
11849	11.00	USA	$24.53	62,865	22	99.923	1.01978	$30,502.70	11.552	11.260	0.292	0.335	0.400	-0.065
12317	10.83	SI	$27.30	234,833	62	99.776	1.01911	$102,409.92	11.370	11.090	0.280	0.340	0.400	-0.060
12583	9.84	SI	$36.60	8,554	10	95.570	1.00734	$1,922.11	10.108	10.100	0.008	0.410	0.400	0.010
12541	9.45	SI	$42.50	39,529	10	95.201	1.00629	$8,832.92	9.823	9.710	0.113	0.486	0.400	0.086
12583	11.81	SI	$39.40	27,241	16	94.974	1.00564	$5,062.36	12.063	12.070	-0.007	0.405	0.400	0.005
12583	10.24	SI	$37.20	6,846	4	73.238	0.93874	($13,043.63)	10.285	10.500	-0.215	0.635	0.400	0.235

2000 Totals

			Quality Level	Pay Factor	I/DP		X - TV	St. Dev.	V	StDev - V
Processes:	16	**Best:**	100.000	1.02000	$102,409.92		0.474	0.189	0.400	-0.250
Tests:	176	**Worst:**	73.238	0.93874	($13,043.63)		-0.215	16.137	0.400	0.235
SY:	500,108	**Weighted Ave.:**	98.790	1.01636	$13,270.61		0.252	0.343	0.400	-0.057

Subacct.	Item (inch)	Orig. Unit	Price	Quant SY	Tests	Quality Level	Pay Factor	I/DP	Mean	TV = PT + (0.65 * V) TV	X - TV	St. Dev.	V	Std Dev - V
12542	12.40	SI	$54.21	3,886	4	100.000	1.02000	$3,521.69	13.386	12.660	0.726	0.000	0.400	-0.400
11985	8.00	USA	$19.52	779	4	100.000	1.02000	$304.05	8.700	8.260	0.440	0.245	0.400	-0.155
12644	8.50	USA	$24.77	9,951	4	100.000	1.02000	$4,928.49	8.800	8.760	0.040	0.294	0.400	-0.106
12644	12.50	USA	$28.34	18,892	6	100.000	1.02000	$10,707.99	12.983	12.760	0.223	0.354	0.400	-0.046
11985	8.00	USA	$19.52	4,000	4	100.000	1.02000	$1,561.21	8.525	8.260	0.265	0.427	0.400	0.027
12542	10.43	SI	$40.65	1,761	12	100.000	1.02000	$1,196.68	11.147	10.690	0.457	0.266	0.400	-0.134
12542	10.83	SI	$46.20	1,694	4	100.000	1.02000	$1,308.06	11.122	11.090	0.032	0.331	0.400	-0.069
12056	10.83	SI	$33.00	11,260	12	100.000	1.02000	$6,213.58	11.483	11.090	0.393	0.342	0.400	-0.058
12636	12.60	SI	$29.82	15,463	7	100.000	1.02000	$7,710.86	13.203	12.860	0.343	0.427	0.400	0.027
12542	10.43	SI	$40.65	1,487	5	100.000	1.02000	$1,010.31	11.142	10.690	0.452	0.431	0.400	0.031
12542	12.40	SI	$43.12	2,784	5	100.000	1.02000	$2,007.17	13.051	12.660	0.391	0.500	0.400	0.100
12542	12.40	SI	$43.12	3,332	5	100.000	1.02000	$2,402.05	13.130	12.660	0.470	0.519	0.400	0.119
12542	10.43	SI	$40.65	244	3	100.000	1.02000	$165.81	10.958	10.690	0.268	0.542	0.400	0.142
12542	12.40	SI	$54.21	1,879	3	100.000	1.02000	$1,702.85	12.763	12.660	0.103	0.542	0.400	0.142
12542	12.40	SI	$43.12	299	3	100.000	1.02000	$215.55	13.058	12.660	0.398	0.568	0.400	0.168
12489	10.75	USA	$26.22	232,911	58	99.999	1.02000	$122,108.43	11.553	11.010	0.543	0.307	0.400	-0.093
12847	9.00	USA	$18.00	45,189	13	99.998	1.01999	$16,262.93	9.225	9.260	-0.035	0.210	0.400	-0.190
13210	6.00	USA	$19.50	75,409	19	99.993	1.01998	$29,379.20	6.632	6.260	0.372	0.327	0.400	-0.073
13210	6.00	USA	$19.50	80,000	20	99.975	1.01993	$31,085.43	6.569	6.260	0.309	0.323	0.400	-0.077
12379	10.50	USA	$42.00	7,385	10	99.951	1.01986	$6,159.74	10.929	10.760	0.169	0.334	0.400	-0.066
12644	8.50	USA	$21.52	194,041	50	99.942	1.01977	$82,542.87	8.998	8.760	0.238	0.290	0.400	-0.110
12542	12.40	SI	$43.12	6,460	8	99.916	1.01983	$4,618.79	13.041	12.660	0.381	0.459	0.400	0.059
11848	10.00	USA	$29.04	171,047	44	99.801	1.01921	$95,397.03	10.353	10.260	0.093	0.273	0.400	-0.127
11985	8.00	USA	$19.52	7,480	15	99.790	1.01940	$2,832.44	8.687	8.260	0.427	0.434	0.400	0.034
12636	12.60	SI	$29.82	242,242	63	99.207	1.01683	$101,636.04	12.906	12.860	0.046	0.297	0.400	-0.103
12542	12.40	SI	$43.12	6,128	7	98.515	1.01703	$3,762.88	12.866	12.660	0.206	0.471	0.400	0.071
12644	8.50	USA	$20.97	188,822	49	98.464	1.01386	$54,864.80	8.888	8.760	0.128	0.372	0.400	-0.028
13390	9.06	SI	$38.16	24,442	19	98.410	1.01546	$12,053.82	9.464	9.320	0.144	0.394	0.400	-0.006
12847	9.00	USA	$18.00	84,000	21	98.166	1.01476	$22,315.05	8.999	9.260	-0.261	0.199	0.400	-0.201
11985	8.00	USA	$19.52	276,046	76	97.712	1.01085	$58,460.13	8.389	8.260	0.129	0.399	0.400	-0.001
12056	11.42	SI	$33.50	18,355	19	97.479	1.01280	$6,578.39	11.762	11.680	0.082	0.394	0.400	-0.006
13390	8.27	SI	$52.41	6,222	27	97.074	1.00830	$2,261.66	8.800	8.530	0.270	0.502	0.400	0.102
93222	12.00	USA	$34.52	98,116	25	96.496	1.00999	$33,832.95	12.324	12.260	0.064	0.410	0.400	0.010
12056	12.40	SI	$34.00	12,988	11	95.895	1.00827	$3,054.33	13.002	12.660	0.342	0.608	0.400	0.208
12636	12.60	SI	$29.82	24,769	10	95.548	1.00728	$4,495.86	13.022	12.860	0.162	0.508	0.400	0.108
13390	8.27	SI	$52.41	15,811	28	94.840	0.99892	($747.91)	8.605	8.530	0.075	0.456	0.400	0.056
12636	12.60	SI	$38.00	19,267	6	91.792	1.00358	$2,194.54	12.910	12.860	0.050	0.533	0.400	0.133
12056	12.99	SI	$32.25	117,000	38	90.189	0.96749	($102,559.00)	13.248	13.250	-0.002	0.505	0.400	0.105

Subacct.	Item (inch)	Orig. Unit	Price	Quant SY	Tests	Quality Level	Pay Factor	I/DP	Mean	TV	X - TV	St. Dev.	V	Std Dev - V
12636	12.60	SI	$29.83	67,902	25	89.409	0.97810	($37,072.01)	12.693	12.860	-0.167	0.393	0.400	-0.007
13390	11.42	SI	$46.42	36,395	22	87.807	0.96833	($44,735.99)	11.668	11.680	-0.012	0.555	0.400	0.155

2001 Totals

					Quality Level	Pay Factor	I/DP		X - TV	St. Dev.	V	StDev - V
Processes:	40	**Best:**	100.000	1.02000	$122,108.43				0.726	0.001	0.400	-0.400
Tests:	764	**Worst:**	87.807	0.96749	($102,559.00)				-0.261	15.431	0.400	0.208
SY:	2,136,138	**Weighted Ave.:**	97.899	1.01139	$13,893.47				0.155	0.350	0.400	-0.050

2002 Thickness

TV = PT + (0.65 * V)

Subacct.	Item (inch)	Orig. Unit	Price	Quant SY	Tests	Quality Level	Pay Factor	I/DP	Mean	TV	X - TV	St. Dev.	V	Std Dev - V
13275	12.50	USA	$32.00	63,347	13	100.000	1.02000	$40,537.22	12.931	12.760	0.171	0.272	0.400	-0.128
11925	10.50	USA	$27.00	3,245	4	100.000	1.02000	$1,751.86	10.950	10.760	0.190	0.387	0.400	-0.013
11925	8.00	USA	$23.00	9,216	5	100.000	1.02000	$4,238.30	8.540	8.260	0.280	0.434	0.400	0.034
11925	11.00	USA	$28.00	5,236	4	100.000	1.02000	$2,931.43	11.400	11.260	0.140	0.469	0.400	0.069
12614	9.45	SI	$48.03	17,154	4	100.000	1.02000	$13,774.44	10.236	9.710	0.526	0.394	0.400	-0.006
11925	8.50	USA	$23.50	27,411	36	99.961	1.01984	$12,782.74	9.186	8.760	0.426	0.348	0.400	-0.052
11925	13.00	USA	$26.22	251,941	88	99.949	1.01979	$130,758.01	13.619	13.260	0.359	0.319	0.400	-0.081
12638	12.50	USA	$34.00	34,871	11	99.895	1.01970	$23,356.07	12.873	12.760	0.113	0.313	0.400	-0.087
13294	5.75	USA	$20.00	105,000	21	99.228	1.01779	$37,366.59	6.221	6.010	0.211	0.383	0.400	-0.017
12390	8.00	USA	$40.38	12,929	21	99.212	1.01775	$9,265.09	8.530	8.260	0.270	0.410	0.400	0.010
11925	13.00	USA	$26.22	251,042	87	98.964	1.01586	$104,368.23	13.460	13.260	0.200	0.376	0.400	-0.024
12390	11.00	USA	$42.95	13,431	28	97.190	1.00876	$5,053.27	11.364	11.260	0.104	0.410	0.400	0.010
13573	13.00	USA	$42.00	35,000	7	94.251	1.00850	$12,499.21	13.286	13.260	0.026	0.466	0.400	0.066
13573	12.00	USA	$42.00	20,000	4	90.119	1.00682	$5,731.70	12.250	12.260	-0.010	0.540	0.400	0.140
12614	10.43	SI	$44.41	24,091	6	87.893	0.98803	($10,709.65)	10.581	10.690	-0.109	0.469	0.400	0.069

2002 Totals

					Quality Level	Pay Factor	I/DP		X - TV	St. Dev.	V	StDev - V
Processes:	15	**Best:**	100.000	1.02000	$130,758.01				0.526	0.272	0.400	-0.128
Tests:	339	**Worst:**	87.893	0.98803	($10,709.65)				-0.109	11.911	0.400	0.140
SY:	873,914	**Weighted Ave.:**	98.745	1.01662	$26,246.97				0.235	0.362	0.400	-0.038

2003 Thickness

TV = PT + (0.65 * V)

Subacct.	Item (inch)	Orig. Unit	Price	Quant SY	Tests	Quality Level	Pay Factor	I/DP	Mean	TV	X - TV	St. Dev.	V	Std Dev - V
13344	13.00	USA	$38.77	18,284	5	100.000	1.02000	$14,173.87	13.000	13.260	-0.260	0.001	0.400	-0.399
13804	10.00	USA	$41.40	932	3	100.000	1.02000	$771.50	11.000	10.260	0.740	0.001	0.400	-0.399
13804	13.50	USA	$41.92	6,043	3	100.000	1.02000	$5,065.18	13.987	13.760	0.227	0.176	0.400	-0.224
13858	6.00	USA	$14.35	11,489	4	100.000	1.02000	$3,296.52	6.813	6.260	0.553	0.239	0.400	-0.161
13858	6.00	USA	$14.35	65,107	17	100.000	1.02000	$18,684.77	6.765	6.260	0.505	0.272	0.400	-0.128
13858	6.00	USA	$14.35	22,979	5	100.000	1.02000	$6,593.32	6.550	6.260	0.290	0.326	0.400	-0.074
13804	8.00	USA	$34.16	87	4	100.000	1.02000	$59.42	8.750	8.260	0.490	0.354	0.400	-0.046
13897	8.00	USA	$31.00	3,072	6	100.000	1.02000	$1,904.64	8.700	8.260	0.440	0.482	0.400	0.082
13831	12.50	USA	$27.25	92,389	19	99.974	1.01993	$50,163.59	12.974	12.760	0.214	0.294	0.400	-0.106
13480	10.24	SI	$41.85	30,616	15	99.874	1.01964	$21,041.12	10.709	10.500	0.209	0.333	0.400	-0.067
13480	11.81	SI	$42.06	80,946	30	99.781	1.01912	$54,439.94	12.336	12.070	0.266	0.343	0.400	-0.057
13278	11.00	USA	$38.00	16,609	50	99.539	1.01815	$11,458.30	11.649	11.260	0.389	0.415	0.400	0.015
13480	9.84	SI	$41.93	19,407	20	98.158	1.01474	$10,026.46	10.344	10.100	0.244	0.449	0.400	0.049
13897	10.00	USA	$24.00	43,023	23	98.096	1.01456	$15,031.89	10.372	10.260	0.112	0.387	0.400	-0.013
13529	8.00	USA	$21.10	137,704	48	95.896	1.00358	$10,413.78	8.406	8.260	0.146	0.469	0.400	0.069
13804	8.00	USA	$34.16	2,328	3	53.919	0.83813	($12,872.77)	7.750	8.260	-0.510	1.058	0.400	0.658

2003 Totals

				Quality Level	Pay Factor	I/DP		X - TV	St. Dev.	V	StDev - V
Processes:	16	**Best:**		100.000	1.02000	$54,439.94		0.740	0.001	0.400	-0.399
Tests:	255	**Worst:**		53.919	0.83813	($12,872.77)		-0.510	11.410	0.400	0.658
SY:	551,015	**Weighted Ave.:**		98.509	1.01430	$13,140.72		0.231	0.354	0.400	-0.046

2004 Thickness

									TV = PT + (0.65 * V)					
Subacct.	Item (inch)	Orig. Unit	Price	Quant SY	Tests	Quality Level	Pay Factor	I/DP	Mean	TV	X - TV	St. Dev.	V	Std Dev - V
13967	12.50	USA	$38.00	12,892	5	100.000	1.02000	$9,795.47	12.600	12.760	-0.160	0.122	0.400	-0.278
14948	8.00	USA	$53.43	10,580	10	100.000	1.02000	$11,305.22	8.340	8.260	0.080	0.143	0.400	-0.257
14242	6.00	USA	$19.06	70,293	16	100.000	1.02000	$26,787.55	6.929	6.260	0.669	0.285	0.400	-0.115
14242	6.00	USA	$19.06	35,390	12	100.000	1.02000	$13,486.57	6.838	6.260	0.578	0.343	0.400	-0.057
14242	6.00	USA	$19.06	2,092	4	100.000	1.02000	$797.07	6.827	6.260	0.567	0.345	0.400	-0.055
13885	10.00	USA	$45.00	31,097	10	99.999	1.02000	$27,983.29	10.400	10.260	0.140	0.293	0.400	-0.107
14342	9.00	USA	$47.88	13,600	17	99.729	1.01923	$12,519.14	9.618	9.260	0.358	0.408	0.400	0.008
13967	8.50	USA	$28.00	35,903	14	98.494	1.01570	$15,778.12	8.843	8.760	0.083	0.369	0.400	-0.031

2004 Totals

			Quality Level	Pay Factor	I/DP	X - TV	St. Dev.	V	StDev - V
Processes:	8	Best:	100.000	1.02000	$27,983.29	0.669	0.122	0.400	-0.278
Tests:	88	Worst:	98.494	1.01570	$797.07	-0.160	0.408	0.400	0.008
SY:	211,847	Weighted Ave.:	99.727	1.01922	$14,806.55	0.376	0.302	0.400	-0.098

Totals 1/1/2000 to 12/31/2004

			Quality Level	Pay Factor	I/DP	X - TV	St. Dev.	V	StDev - V
Projects:	36								
Processes:	95	Best:	100.000	1.02000	$130,758.01	0.740	0.001	0.400	-0.400
Tests:	1,622	Worst:	53.919	0.83813	($102,559.00)	-0.510	16.137	0.400	0.658
SY:	4,273,022	Weighted Ave.:	98.345	1.01381	$15,689.23	0.204	0.350	0.400	-0.050

Compressive Strength, Process Information by Year

Criteria: Projects with Start Dates from 1/1/2000 to 12/31/2004.

Processes with less than 3 tests not included.

2000 Compressive Strength

TV = LSL + (1.65 * V)

Sub.	Item (inch)	Orig. Unit	Price	Quant SY	Tests	Quality Level	Pay Factor	I/DP	Mean	TV	X - TV	St Dev	V	Std Dev - V
12583	10.24	SI	$37.20	12,947	9	100.000	1.02000	$8,053.80	6,172	4,860	1,312	300	400	-100
12317	10.83	SI	$27.30	246,831	25	100.000	1.02000	$112,678.94	6,074	4,860	1,214	327	400	-73
12541	9.45	SI	$42.50	39,529	4	100.000	1.02000	$28,086.33	5,265	4,860	405	392	400	-8
12583	11.81	SI	$39.40	26,607	15	100.000	1.02000	$17,529.76	6,322	4,860	1,462	500	400	100
12583	10.83	SI	$38.00	6,339	5	100.000	1.02000	$4,026.99	6,878	4,860	2,018	650	400	250
12541	10.43	SI	$49.50	25,519	3	100.000	1.02000	$21,118.35	5,420	4,860	560	843	400	443
12583	8.27	SI	$34.40	2,152	3	100.000	1.02000	$1,237.40	5,623	4,860	763	1,045	400	645
12583	9.84	SI	$36.60	6,817	5	96.042	1.01472	$3,070.71	6,445	4,860	1,585	1,404	400	1,004
12541	10.43	SI	$36.30	24,584	3	78.500	0.96615	($25,259.60)	4,864	4,860	4	569	400	169

2000 Totals

				Quality Level	Pay Factor	I/DP	Mean	TV	X - TV	St. Dev.	V	StDev - V
Processes:	9		**Best:**	100.000	1.02000	$112,678.94	6,878	4,860	2,018	300	400	-100
Tests:	72		**Worst:**	78.500	0.96615	($25,259.60)	4,864	4,860	4	1,404	400	1,004
Sq Yds:	391,323		**Weighted Ave.:**	98.580	1.01653	$18,949.19	5,910	4,860	1,050	421	400	21

Report 5   *Comp. Str. by Year* 1/1/2000 to 12/31/2004   *Page 1 of 5*

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TV = LSL + (1.65 * V)

Sub.	Item (inch)	Orig. Unit	Price	Quant SY	Tests	Quality Level	Pay Factor	I/DP	Mean	TV	X - TV	St Dev	V	Std Dev - V
13210	6.00	USA	$19.50	75,409	7	100.000	1.02000	$29,409.51	4,764	4,860	-96	133	400	-267
12847	7.00	USA	$39.00	1,187	3	100.000	1.02000	$925.63	4,613	4,860	-247	179	400	-221
12542	12.40	SI	$43.12	2,819	5	100.000	1.02000	$2,032.17	5,819	4,860	959	220	400	-180
12542	12.40	SI	$43.12	1,458	7	100.000	1.02000	$1,051.27	5,949	4,860	1,089	283	400	-117
12379	10.50	USA	$42.00	7,385	11	100.000	1.02000	$6,203.09	6,006	4,860	1,146	305	400	-95
12542	11.42	SI	$46.81	2,251	10	100.000	1.02000	$1,761.84	6,154	4,860	1,294	320	400	-80
12542	12.40	SI	$43.12	7,036	13	100.000	1.02000	$5,073.25	6,499	4,860	1,639	328	400	-73
12644	8.50	USA	$20.97	188,822	22	100.000	1.02000	$79,188.51	5,702	4,860	842	346	400	-54
12056	10.83	SI	$33.00	11,260	12	100.000	1.02000	$6,213.59	6,056	4,860	1,196	388	400	-12
12056	11.42	SI	$33.50	18,355	25	100.000	1.02000	$10,281.98	6,025	4,860	1,165	391	400	-9
93222	12.00	USA	$34.52	98,116	11	100.000	1.02000	$67,735.90	6,298	4,860	1,438	420	400	20
12542	10.43	SI	$40.65	244	4	100.000	1.02000	$165.81	5,370	4,860	510	422	400	22
12542	12.40	SI	$43.12	6,460	8	100.000	1.02000	$4,657.82	6,131	4,860	1,271	425	400	25
12644	8.50	USA	$24.77	9,951	4	100.000	1.02000	$4,928.49	5,530	4,860	670	432	400	32
12644	8.50	USA	$24.77	10,699	5	100.000	1.02000	$5,298.96	6,094	4,860	1,234	463	400	63
13210	6.00	USA	$19.50	80,000	8	100.000	1.02000	$31,200.00	5,746	4,860	886	468	400	68
13390	11.42	SI	$46.42	36,395	22	100.000	1.02000	$28,250.73	6,639	4,860	1,779	474	400	74
12644	8.50	USA	$21.52	168,010	25	100.000	1.02000	$72,309.24	6,044	4,860	1,184	476	400	76
13390	7.48	SI	$47.43	3,337	6	100.000	1.02000	$2,646.59	6,565	4,860	1,705	493	400	93
12542	10.83	SI	$46.20	1,694	3	100.000	1.02000	$1,308.06	5,821	4,860	961	507	400	107
12542	12.40	SI	$43.12	3,332	9	100.000	1.02000	$2,402.65	5,980	4,860	1,120	514	400	114
12644	8.50	USA	$21.52	26,031	5	100.000	1.02000	$11,201.16	5,746	4,860	886	547	400	147
12644	12.50	USA	$28.34	18,892	6	100.000	1.02000	$10,707.99	6,223	4,860	1,363	563	400	163
12542	5.91	SI	$40.14	1,166	3	100.000	1.02000	$782.53	5,429	4,860	569	583	400	183
13390	8.86	SI	$38.16	24,442	19	100.000	1.02000	$15,596.37	6,508	4,860	1,648	612	400	212
12542	12.40	SI	$54.21	3,886	5	100.000	1.02000	$3,521.69	6,596	4,860	1,736	684	400	284
12542	10.43	SI	$40.65	1,487	4	100.000	1.02000	$1,010.31	6,853	4,860	1,993	692	400	292
12542	12.40	SI	$54.21	1,879	3	100.000	1.02000	$1,702.85	6,643	4,860	1,783	749	400	349
93222	11.00	USA	$38.00	12,156	3	100.000	1.02000	$9,236.25	6,213	4,860	1,353	815	400	415
12056	12.99	SI	$32.25	117,000	42	99.983	1.01993	$62,883.80	5,774	4,860	914	427	400	27
13390	8.27	SI	$52.41	15,908	29	99.965	1.01986	$13,843.19	6,459	4,860	1,599	684	400	284
12056	12.40	SI	$34.00	12,988	14	99.962	1.01989	$7,344.17	5,779	4,860	919	520	400	120
12847	9.00	USA	$18.00	45,189	13	99.938	1.01982	$16,122.51	5,322	4,860	462	426	400	26
12847	9.00	USA	$18.00	84,000	22	99.579	1.01880	$28,419.74	5,092	4,860	232	364	400	-36
12542	10.43	SI	$40.65	1,761	14	99.505	1.01858	$1,112.00	5,761	4,860	901	613	400	213

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Sub.	Item (inch)	Orig. Unit	Price	Quant SY	Tests	Quality Level	Pay Factor	I/DP	Mean	TV	X - TV	St. Dev.	V	StDev - V
13390	8.27	SI	$52.41	6,125	26	97.941	1.01176	$3,157.17	5,814	4,860	954	740	400	340
12644	12.50	USA	$28.34	17,484	5	97.071	1.01609	$7,972.68	5,550	4,860	690	873	400	473

2001 Totals

	Quality Level	Pay Factor	I/DP	Mean	TV	X - TV	St. Dev.	V	StDev - V
Best:	100.000	1.02000	$79,188.51	6,853	4,860	1,993	133	400	-267
Worst:	97.071	1.01176	$165.81	4,613	4,860	-247	873	400	473
Weighted Ave.:	99.906	1.01978	$15,071.88	5,796	4,860	936	426	400	26

Processes: 37
Tests: 433
Sq Yds: 1,124,61

2002 Compressive Strength

TV = LSL + (1.65 * V)

Sub.	Item (inch)	Orig. Unit	Price	Quant SY	Tests	Quality Level	Pay Factor	I/DP	Mean	TV	X - TV	St Dev	V	Std Dev - V
13573	12.00	USA	$42.00	25,000	5	100.000	1.02000	$20,994.75	6,072	4,860	1,212	354	400	-46
12614	9.45	SI	$48.03	17,154	4	100.000	1.02000	$13,774.44	5,497	4,860	637	434	400	34
13573	13.00	USA	$42.00	25,000	5	100.000	1.02000	$20,994.75	6,582	4,860	1,722	445	400	45
12638	12.50	USA	$34.00	34,871	8	100.000	1.02000	$23,712.28	6,685	4,860	1,825	482	400	82
13573	13.00	USA	$42.00	20,000	4	100.000	1.02000	$16,795.80	5,693	4,860	833	495	400	95
13275	12.50	USA	$32.00	1,307	3	100.000	1.02000	$836.27	5,210	4,860	350	596	400	196
13275	12.50	USA	$32.00	62,040	22	100.000	1.02000	$39,702.16	6,837	4,860	1,977	755	400	355
12390	11.00	USA	$42.95	13,431	28	99.963	1.01985	$11,452.18	5,868	4,860	1,008	545	400	145
13294	5.75	USA	$20.00	105,000	21	99.953	1.01987	$41,717.55	5,444	4,860	584	427	400	27
12390	8.00	USA	$40.38	12,929	21	99.507	1.01859	$9,705.63	5,762	4,860	902	651	400	251
12614	10.43	SI	$44.41	24,091	6	98.027	1.01605	$14,360.42	5,352	4,860	492	589	400	189

2002 Totals

	Quality Level	Pay Factor	I/DP	Mean	TV	X - TV	St. Dev.	V	StDev - V
Best:	100.000	1.02000	$41,717.55	6,837	4,860	1,977	354	400	-46
Worst:	98.027	1.01605	$836.27	5,210	4,860	350	755	400	355
Weighted Ave.:	99.826	1.01962	$19,458.75	5,993	4,860	1,133	518	400	118

Processes: 11
Tests: 127
Sq Yds: 340,823

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2003 Compressive Strength

TV = LSL + (1.65 * V)

Sub.	Item (inch)	Orig. Unit	Price	Quant SY	Tests	Quality Level	Pay Factor	I/DP	Mean	TV	X - TV	St Dev	V	Std Dev - V
13858	6.00	USA	$14.35	22,979	6	100.000	1.02000	$6,594.97	4,945	4,860	85	132	400	-268
13480	11.81	SI	$42.06	9,140	3	100.000	1.02000	$6,426.84	6,531	4,860	1,671	218	400	-182
13858	6.00	USA	$14.35	11,489	3	100.000	1.02000	$3,296.52	4,787	4,860	-73	232	400	-168
13278	11.00	USA	$38.00	246	3	100.000	1.02000	$186.91	7,123	4,860	2,263	266	400	-134
13480	11.81	SI	$42.06	30,428	10	100.000	1.02000	$21,400.57	5,712	4,860	852	312	400	-88
13480	9.84	SI	$41.93	1,458	3	100.000	1.02000	$1,021.91	6,976	4,860	2,116	339	400	-61
13480	10.24	SI	$41.85	26,058	14	100.000	1.02000	$18,235.64	6,369	4,860	1,509	357	400	-44
13480	11.81	SI	$42.06	29,962	12	100.000	1.02000	$21,073.03	6,455	4,860	1,595	402	400	2
13480	9.84	SI	$41.93	7,682	9	100.000	1.02000	$5,386.33	6,243	4,860	1,383	408	400	8
13480	11.81	SI	$42.06	7,867	4	100.000	1.02000	$5,532.03	6,904	4,860	2,044	418	400	18
13278	11.00	USA	$38.00	1,582	4	100.000	1.02000	$1,202.02	6,730	4,860	1,870	459	400	59
13804	13.50	USA	$41.92	6,043	3	100.000	1.02000	$5,065.18	6,080	4,860	1,220	459	400	59
13344	13.00	USA	$38.77	18,284	5	100.000	1.02000	$14,173.87	6,136	4,860	1,276	482	400	82
13804	8.00	USA	$34.16	2,415	3	100.000	1.02000	$1,649.52	5,717	4,860	857	901	400	501
13858	6.00	USA	$14.35	65,107	17	99.985	1.01996	$18,645.62	5,337	4,860	477	380	400	-20
13278	11.00	USA	$38.00	4,867	10	99.963	1.01989	$3,679.26	5,575	4,860	715	548	400	148
13278	11.00	USA	$38.00	8,488	27	99.195	1.01678	$5,412.08	5,051	4,860	191	371	400	-29
13480	9.84	SI	$41.93	7,060	6	95.510	1.01102	$2,727.73	5,091	4,860	231	487	400	87
13804	10.00	USA	$41.40	932	3	90.650	1.00753	$290.59	5,583	4,860	723	1,252	400	852

2003   Totals

			Quality Level	Pay Factor	I/DP	Mean	TV	X - TV	St. Dev.	V	StDev - V
Processes:	19	**Best:**	100.000	1.02000	$21,400.57	7,123	4,860	2,263	132	400	-268
Tests:	145	**Worst:**	90.650	1.00753	$186.91	4,787	4,860	-73	1,252	400	852
Sq Yds:	262,087	**Weighted Ave.:**	99.815	1.01960	$7,473.72	5,753	4,860	893	363	400	-37

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2004 Compressive Strength

| | | | | | | | | | TV = LSL + (1.65 * V) | | | | | |
Sub.	Item (inch)	Orig. Unit	Price	Quant SY	Tests	Quality Level	Pay Factor	I/DP	Mean	TV	X - TV	St Dev	V	Std Dev - V
14242	6.00	USA	$19.06	2,092	4	100.000	1.02000	$797.07	5,180	4,860	320	260	400	-140
14242	6.00	USA	$19.06	21,656	6	100.000	1.02000	$8,253.17	5,028	4,860	168	283	400	-117
14948	8.00	USA	$53.43	10,580	10	100.000	1.02000	$11,305.22	6,544	4,860	1,684	413	400	13
14242	6.00	USA	$19.06	5,672	4	100.000	1.02000	$2,161.08	5,450	4,860	590	679	400	279
13885	10.00	USA	$45.00	31,097	10	100.000	1.02000	$27,985.90	6,912	4,860	2,052	689	400	289
14242	6.00	USA	$19.06	32,552	8	99.852	1.01970	$12,221.47	5,135	4,860	275	424	400	24
14242	6.00	USA	$19.06	32,558	6	99.763	1.01953	$12,114.02	4,710	4,860	-150	265	400	-135
13967	8.50	USA	$28.00	35,903	23	98.550	1.01586	$15,938.84	5,169	4,860	309	464	400	64
14342	9.00	USA	$47.88	13,600	17	98.407	1.01545	$10,059.81	5,397	4,860	537	592	400	192
13967	12.50	USA	$38.00	12,892	10	91.539	0.99109	($4,363.69)	5,508	4,860	648	975	400	575
14242	6.00	USA	$19.06	13,245	7	80.160	0.94409	($14,111.64)	4,370	4,860	-490	196	400	-204

2004 Totals

			Quality Level	Pay Factor	I/DP	Mean	TV	X - TV	St. Dev.	V	StDev - V
Processes:	11	Best:	100.000	1.02000	$27,985.90	6,912	4,860	2,052	196	400	-204
Tests:	105	Worst:	80.160	0.94409	($14,111.64)	4,370	4,860	-490	975	400	575
Sq Yds:	211,847	Weighted Ave.:	97.838	1.01238	$7,487.39	5,396	4,860	536	465	400	65

Totals: 1/1/2000 to 12/31/2004.

			Quality Level	Pay Factor	I/DP	Mean	TV	X - TV	St. Dev.	V	StDev - V
Projects:	27	Best:	100.000	1.02000	$112,678.94	7,123	4,860	2,263	132	400	-268
Processes:	87	Worst:	78.500	0.94409	($25,259.60)	4,370	4,860	-490	1,404	400	1,004
Tests:	882										
Sq Yds:	2,330,69	Weighted Ave.:	99.473	1.01852	$13,409.31	5,803	4,860	943	435	400	35

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Sand Equivalent, Process Information by Year

Criteria: Projects with Bid Dates from 1/1/2000 to 12/31/2004.

Processes with less than 3 tests not included.

2000 Sand Equivalent

Sub.	Item (inch)	Orig. Unit	Price	Quant SY	Tests	QL	PF	I/DP	Mean	TV	X - TV	St Dev	V	St Dev - V
										TV = LSL + (1.65 * V)				
12541	10.43	SI	$49.50	25,519	3	100.000	1.01000	$10,561.82	95.30	86.60	8.70	0.577	4.000	-3.423
12583	8.27	SI	$34.40	3,295	6	100.000	1.01000	$947.72	87.80	86.60	1.20	1.329	4.000	-2.671
12583	10.83	SI	$38.00	6,812	6	100.000	1.01000	$2,164.48	88.50	86.60	1.90	1.517	4.000	-2.483
12583	10.24	SI	$37.20	12,212	7	100.000	1.01000	$3,798.49	87.60	86.60	1.00	1.718	4.000	-2.282
12317	10.83	SI	$27.30	246,831	25	100.000	1.01000	$56,342.29	89.10	86.60	2.50	2.068	4.000	-1.932
12583	9.84	SI	$36.60	9,365	10	100.000	1.01000	$2,865.78	87.70	86.60	1.10	2.710	4.000	-1.290
12541	9.45	SI	$42.50	39,529	4	100.000	1.01000	$14,046.68	89.30	86.60	2.70	5.500	4.000	1.500
12583	11.81	SI	$39.40	32,872	20	99.994	1.00999	$10,823.06	88.30	86.60	1.70	2.573	4.000	-1.427

2000 SE Totals:

				Quality Level	Pay Factor	I/DP	Mean	TV	X - TV	St. Dev.	V	StDev - V
Processes:	8		**Best:**	100.000	1.01000	$56,342.29	95.30	86.60	8.70	0.577	4.000	-3.423
Tests:	81		**Worst:**	99.994	1.00999	$947.72	87.60	86.60	1.00	5.500	4.000	1.500
SY:	376,434	**Weighted Ave.:**		99.999	1.01000	$12,693.79	89.37	86.60	2.77	2.360	4.000	-1.640

Sub.	Item (inch)	Orig. Unit	Price	Quant SY	Tests	QL	PF	I/DP	Mean	TV	X - TV	St Dev	V	St Dev - V
12542	12.40	SI	$43.12	2,819	5	100.000	1.01000	$1,016.34	92.60	86.60	6.00	0.548	4.000	-3.452
12847	7.00	USA	$39.00	1,187	3	100.000	1.01000	$462.93	81.70	86.60	-4.90	0.577	4.000	-3.423
12644	12.50	USA	$28.34	17,484	5	100.000	1.01000	$4,954.97	98.60	86.60	12.00	0.894	4.000	-3.106
93222	11.00	USA	$38.00	12,146	3	100.000	1.01000	$4,615.48	93.70	86.60	7.10	1.155	4.000	-2.845
12542	12.40	SI	$54.21	1,879	3	100.000	1.01000	$851.64	89.30	86.60	2.70	1.155	4.000	-2.845
12644	8.50	USA	$24.77	10,699	5	100.000	1.01000	$2,650.14	97.20	86.60	10.60	1.304	4.000	-2.696
12644	8.50	USA	$21.52	194,041	26	100.000	1.01000	$41,758.42	97.80	86.60	11.20	1.317	4.000	-2.683
12644	8.50	USA	$20.97	188,822	25	100.000	1.01000	$39,596.24	94.20	86.60	7.60	1.344	4.000	-2.656
12644	8.50	USA	$24.77	9,951	4	100.000	1.01000	$2,464.86	94.00	86.60	7.40	1.414	4.000	-2.586
12542	10.83	SI	$46.20	1,694	3	100.000	1.01000	$654.19	94.70	86.60	8.10	1.528	4.000	-2.472
12542	10.43	SI	$40.65	244	3	100.000	1.01000	$82.93	95.00	86.60	8.40	1.732	4.000	-2.268
12644	12.50	USA	$28.34	18,892	4	100.000	1.01000	$5,353.99	96.30	86.60	9.70	1.893	4.000	-2.107
12379	10.50	USA	$42.00	7,385	11	100.000	1.01000	$3,101.70	91.10	86.60	4.50	2.071	4.000	-1.929
13390	7.48	SI	$47.43	3,337	6	100.000	1.01000	$1,323.30	88.20	86.60	1.60	2.137	4.000	-1.863
12056	10.83	SI	$33.00	11,260	12	100.000	1.01000	$3,106.95	90.50	86.60	3.90	2.276	4.000	-1.724
12542	10.43	SI	$40.65	1,761	13	100.000	1.01000	$598.37	91.50	86.60	4.90	2.332	4.000	-1.668
12056	11.42	SI	$33.50	18,355	25	100.000	1.01000	$5,141.25	90.70	86.60	4.10	2.610	4.000	-1.390
93222	12.00	USA	$34.52	98,116	11	100.000	1.01000	$33,869.64	92.30	86.60	5.70	2.649	4.000	-1.351
13210	6.00	USA	$19.50	155,409	15	100.000	1.01000	$30,304.76	89.60	86.60	3.00	2.667	4.000	-1.333
12542	12.40	SI	$43.12	6,460	8	100.000	1.01000	$2,328.91	91.40	86.60	4.80	2.825	4.000	-1.175
12542	10.43	SI	$40.65	1,487	4	100.000	1.01000	$505.28	90.50	86.60	3.90	3.109	4.000	-0.891
12542	11.42	SI	$46.81	2,251	10	100.000	1.01000	$880.96	91.20	86.60	4.60	3.553	4.000	-0.447
12542	12.40	SI	$54.21	3,886	5	100.000	1.01000	$1,761.28	88.60	86.60	2.00	3.782	4.000	-0.218
12056	12.99	SI	$32.25	117,000	43	99.977	1.00995	$31,404.72	89.00	86.60	2.40	2.734	4.000	-1.266
12542	12.40	SI	$43.12	3,332	5	99.560	1.00971	$1,166.13	88.20	86.60	1.60	4.764	4.000	0.764
12847	9.00	USA	$18.00	45,189	13	99.235	1.00891	$7,247.26	82.10	86.60	-4.50	0.954	4.000	-3.046
13390	11.42	SI	$46.42	36,395	22	99.168	1.00881	$12,450.63	88.30	86.60	1.70	3.682	4.000	-0.318
12542	315.00	USA	$43.12	5,883	13	98.213	1.00745	$1,889.75	86.10	86.60	-0.50	3.121	4.000	-0.879
12056	12.40	SI	$34.00	12,988	14	96.349	1.00479	$1,767.17	87.30	86.60	0.70	4.250	4.000	0.250
13390	8.27	SI	$52.41	6,222	27	94.413	0.99604	($1,080.76)	85.80	86.60	-0.80	3.711	4.000	-0.289
13390	8.86	SI	$38.16	24,442	19	91.455	0.99058	($7,347.09)	86.00	86.60	-0.60	4.435	4.000	0.435
12847	9.00	USA	$18.00	84,000	22	90.960	0.98756	($18,808.65)	82.40	86.60	-4.20	1.817	4.000	-2.183
13390	8.27	SI	$52.41	15,811	28	90.728	0.97113	($19,999.42)	85.70	86.60	-0.90	4.345	4.000	0.345

TV = LSL + (1.65 * V)

2001 SE Totals:

			Quality Level	Pay Factor	I/DP	Mean	TV	X - TV	St. Dev.	V	StDev - V
Processes:	33	**Best:**	100.000	1.01000	$41,758.42	98.60	86.60	12.00	0.548	4.000	-3.452
Tests:	415	**Worst:**	90.728	0.97113	($19,999.42)	81.70	86.60	-4.90	4.764	4.000	0.764
SY:	1,120,825	**Weighted Ave.:**	98.861	1.00711	$5,941.64	91.34	86.60	4.74	2.114	4.000	-1.886

2002 Sand Equivalent

TV = LSL + (1.65 * V)

Sub.	Item (inch)	Orig. Unit	Price	Quant SY	Tests	QL	PF	I/DP	Mean	TV	X - TV	St Dev	V	St Dev - V
13275	12.50	USA	$32.00	63,347	13	100.000	1.01000	$20,271.04	97.40	86.60	10.80	1.121	4.000	-2.879
12390	11.00	USA	$42.95	13,431	28	100.000	1.01000	$5,768.61	90.90	86.60	4.30	1.380	4.000	-2.620
12614	10.43	SI	$44.41	24,091	6	100.000	1.01000	$8,945.51	88.70	86.60	2.10	1.506	4.000	-2.494
12638	12.50	USA	$34.00	34,871	8	100.000	1.01000	$11,856.14	92.10	86.60	5.50	1.727	4.000	-2.273
13294	5.75	USA	$20.00	105,000	21	100.000	1.01000	$21,000.00	94.30	86.60	7.70	2.129	4.000	-1.871
12614	9.45	SI	$48.03	17,154	4	100.000	1.01000	$6,888.94	91.00	86.60	4.40	4.163	4.000	0.163
12390	8.00	USA	$40.38	12,929	21	96.181	1.00455	$2,372.88	90.30	86.60	3.70	5.994	4.000	1.994

2002 SE Totals:

			Quality Level	Pay Factor	I/DP	Mean	TV	X - TV	St. Dev.	V	StDev - V
Processes:	7	**Best:**	100.000	1.01000	$21,000.00	97.40	86.60	10.80	1.121	4.000	-2.879
Tests:	101	**Worst:**	96.181	1.00455	$2,372.88	88.70	86.60	2.10	5.994	4.000	1.994
SY:	270,823	**Weighted Ave.:**	99.818	1.00974	$11,014.73	93.68	86.60	7.08	2.062	4.000	-1.938

2003 Sand Equivalent

								TV = LSL + (1.65 * V)					
Sub.	Item (inch)	Orig. Unit	Price	Quant SY	Tests	QL	PF	I/DP	Mean	TV	X - TV	St Dev	V	St Dev - V
13278	11.00	USA	$38.00	1,582	4	100.000	1.01000	$601.16	95.30	86.60	8.70	0.500	4.000	-3.500
13804	8.00	USA	$34.16	2,415	3	100.000	1.01000	$824.96	90.70	86.60	4.10	0.577	4.000	-3.423
13278	11.00	USA	$38.00	4,867	10	100.000	1.01000	$1,849.46	94.90	86.60	8.30	0.994	4.000	-3.006
13278	11.00	USA	$38.00	246	3	100.000	1.01000	$93.48	95.00	86.60	8.40	1.000	4.000	-3.000
13480	11.81	SI	$42.06	80,946	30	100.000	1.01000	$28,466.54	90.70	86.60	4.10	1.143	4.000	-2.857
13344	13.00	USA	$38.77	18,284	5	100.000	1.01000	$7,088.71	97.00	86.60	10.40	1.225	4.000	-2.775
13278	11.00	USA	$38.00	8,488	27	100.000	1.01000	$3,225.44	94.10	86.60	7.50	1.292	4.000	-2.708
13480	10.24	SI	$41.85	30,616	15	100.000	1.01000	$10,713.18	90.90	86.60	4.30	1.438	4.000	-2.562
13858	6.00	USA	$14.35	11,489	3	100.000	1.01000	$1,648.67	82.30	86.60	-4.30	1.528	4.000	-2.472
13480	9.84	SI	$41.93	19,407	20	100.000	1.01000	$6,804.06	90.90	86.60	4.30	1.553	4.000	-2.447
13804	13.50	USA	$41.92	6,043	3	100.000	1.01000	$2,533.23	94.00	86.60	7.40	2.000	4.000	-2.000
13804	10.00	USA	$41.40	932	3	100.000	1.01000	$385.85	90.70	86.60	4.10	2.309	4.000	-1.691
13858	6.00	USA	$14.35	65,107	17	99.876	1.00983	$9,179.79	91.20	86.60	4.60	4.236	4.000	0.236
13858	6.00	USA	$14.35	22,979	7	97.551	1.00755	$2,490.09	84.30	86.60	-2.30	2.498	4.000	-1.502

2003 SE Totals:

		Quality Level	Pay Factor	I/DP	Mean	TV	X - TV	St. Dev.	V	StDev - V
Processes: 14	**Best:**	100.000	1.01000	$28,466.54	97.00	86.60	10.40	0.500	4.000	-3.500
Tests: 150	**Worst:**	97.551	1.00755	$93.48	82.30	86.60	-4.30	4.236	4.000	0.236
SY: 273,401	**Weighted Ave.:**	99.765	1.00975	$5,421.76	90.67	86.60	4.07	2.093	4.000	-1.907

2004 Sand Equivalent

									TV = LSL + (1.65 * V)				
Sub.	Item (inch)	Orig. Unit	Price	Quant SY	Tests	QL	PF	I/DP	Mean	TV	X - TV	St Dev	V	St Dev - V
14242	6.00	USA	$19.06	5,672	4	100.000	1.01000	$1,080.81	90.80	86.60	4.20	0.500	4.000	-3.500
14242	6.00	USA	$19.06	2,092	4	100.000	1.01000	$398.63	90.50	86.60	3.90	0.577	4.000	-3.423
14242	6.00	USA	$19.06	21,656	6	100.000	1.01000	$4,126.59	90.50	86.60	3.90	0.837	4.000	-3.163
14242	6.00	USA	$19.06	32,552	8	100.000	1.01000	$6,202.84	89.10	86.60	2.50	0.991	4.000	-3.009
14242	6.00	USA	$19.06	13,245	6	100.000	1.01000	$2,523.86	89.80	86.60	3.20	1.169	4.000	-2.831
14342	9.00	USA	$47.88	13,600	17	100.000	1.01000	$6,511.68	94.20	86.60	7.60	1.185	4.000	-2.815
14242	6.00	USA	$19.06	32,558	6	100.000	1.01000	$6,203.98	91.30	86.60	4.70	1.751	4.000	-2.249
13885	10.00	USA	$45.00	31,097	10	99.491	1.00928	$12,979.41	83.70	86.60	-2.90	1.703	4.000	-2.297
14948	8.00	USA	$53.43	10,580	10	99.146	1.00878	$4,965.07	84.50	86.60	-2.10	2.173	4.000	-1.827
13967	12.50	USA	$38.00	12,892	11	97.019	1.00574	$2,813.25	87.80	86.60	1.20	4.446	4.000	0.446
13967	8.50	USA	$28.00	35,903	33	96.728	1.00346	$3,474.70	87.90	86.60	1.30	4.376	4.000	0.376

2004 SE Totals:

			Quality Level	Pay Factor	I/DP	Mean	TV	X - TV	St. Dev.	V	StDev - V
Processes:	11	Best:	100.000	1.01000	$12,979.41	94.20	86.60	7.60	0.500	4.000	-3.500
Tests:	115	Worst:	96.728	1.00346	$398.63	83.70	86.60	-2.90	4.446	4.000	0.446
SY:	211,847	Weighted Ave.:	99.147	1.00847	$4,661.89	88.71	86.60	2.11	2.046	4.000	-1.954

SE Totals: 1/1/2000 to 12/31/2004

			Quality Level	Pay Factor	I/DP	Mean	TV	X - TV	St. Dev.	V	StDev - V
Projects:	26										
Processes:	73	Best:	100.000	1.01000	$56,342.29	98.60	86.60	12.00	0.500	4.000	-3.500
Tests:	862	Worst:	90.728	0.97113	($19,999.42)	81.70	86.60	-4.90	5.994	4.000	1.994
SY:	2,253,331	Weighted Ave.:	99.303	1.00836	$6,875.52	90.96	86.60	4.36	2.140	4.000	-1.860

Flexural Strength, Process Information by Year

Criteria: Projects with Start Dates from 1/1/2000 to 12/31/2004.

Processes with less than 3 tests not included.

2000 Flexural Strength

Subacct.	Item (inch)	Orig. Unit	Price	Quant. SY	Tests	Quality Level	Pay Factor	I/DP	Mean	TV	X - TV	St Dev	V	StD Dev - V
										TV = LSL + (V * 1.65)				
11849	11.00		$24.90	17,809	11	99.989	1.02995	$13,283.09	685.5	652.5	33.0	42.922	50.000	-7.078
11849	11.00		$24.90	79,916	32	99.517	1.02710	$53,927.02	666.6	652.5	14.1	39.112	50.000	-10.888
11849	11.00		$24.90	2,010	8	74.096	0.90964	($4,522.63)	601.9	652.5	-50.6	47.730	50.000	-2.270

2000 Totals

		Quality Level	Pay Factor	I/DP	Mean	TV	X - TV	St. Dev	V	StDev - V
Processes: 3	**Best:**	99.989	1.02995	$53,927.02	685.5	652.5	33.0	39.112	50.000	-10.888
Tests: 51	**Worst:**	74.096	0.90964	($4,522.63)	601.9	652.5	-50.6	47.730	50.000	-2.270
SY: 99,735	**Weighted Ave.:**	99.089	1.02524	$20,895.83	668.6	652.5	16.1	39.966	50.000	-10.034

2001 Flexural Strength

Subacct.	Item (inch)	Orig. Unit	Price	Quant. SY	Tests	Quality Level	Pay Factor	I/DP	Mean	TV	X - TV	St Dev	V	StD Dev - V
										TV = LSL + (V * 1.65)				
11848	10.00		$29.04	171,047	18	100.000	1.03000	$149,016.15	663.6	652.5	11.1	9.363	50.000	-40.637
11985	8.00		$19.52	7,480	10	100.000	1.03000	$4,380.29	694.0	652.5	41.5	27.669	50.000	-22.331
12636	12.60		$29.82	21,564	12	100.000	1.03000	$19,291.15	669.2	652.5	16.7	30.289	50.000	-19.711
12636	12.60		$38.00	14,777	7	100.000	1.03000	$16,845.78	704.3	652.5	51.8	41.274	50.000	-8.726
12636	12.60		$29.82	9,003	3	100.000	1.03000	$8,054.08	633.3	652.5	-19.2	45.369	50.000	-4.631
12489	10.75		$26.22	231,995	24	100.000	1.03000	$182,487.27	752.7	652.5	100.2	47.776	50.000	-2.224
12489	10.75		$26.22	916	3	100.000	1.03000	$720.53	720.0	652.5	67.5	55.678	50.000	5.678
12636	12.60	SI	$29.82	39,124	7	100.000	1.03000	$29,265.26	653.7	652.5	1.2	30.603	50.000	-19.397
12636	12.60	SI	$29.82	33,536	6	100.000	1.03000	$25,084.51	738.5	652.5	86.0	60.336	50.000	10.336
11985	8.00		$19.52	280,825	29	99.968	1.02981	$163,383.72	707.6	652.5	55.1	44.413	50.000	-5.587
12636	12.60	SI	$29.82	111,784	20	99.809	1.02918	$81,340.03	674.9	652.5	22.4	40.031	50.000	-9.970
12636	12.60		$29.82	7,052	4	99.197	1.02839	$5,970.88	603.8	652.5	-48.7	22.867	50.000	-27.133
12636	12.60		$29.82	100,386	18	96.216	1.01378	$41,257.53	647.5	652.5	-5.0	45.090	50.000	-4.910

2001 Totals

		Quality Level	Pay Factor	I/DP	Mean	TV	X - TV	St. Dev	V	StDev - V
Processes: 13	**Best:**	100.000	1.03000	$182,487.27	752.7	652.5	100.2	9.363	50.000	-40.637
Tests: 161	**Worst:**	96.216	1.01378	$720.53	603.8	652.5	-48.7	60.336	50.000	10.336
SY: 1,029,489	**Weighted Ave.:**	99.596	1.02827	$55,930.55	697.7	652.5	45.2	38.340	50.000	-11.660

2002 Flexural Strength

Subacct.	Item (inch)	Orig. Unit Price	Quant. SY	Tests	Quality Level	Pay Factor	I/DP	Mean	TV = LSL + (V * 1.65) TV	X - TV	St Dev	V	StD Dev - V
11925	8.50	$23.50	1,393	3	100.000	1.03000	$982.07	640.0	652.5	-12.5	8.660	50.000	-41.340
11925	8.50	$23.50	2,750	4	100.000	1.03000	$1,938.75	632.5	652.5	-20.0	9.574	50.000	-40.426
11925	8.00	$23.00	7,322	5	100.000	1.03000	$5,052.18	684.0	652.5	31.5	14.748	50.000	-35.252
11925	13.00	$26.22	5,886	3	100.000	1.03000	$4,629.93	685.0	652.5	32.5	17.321	50.000	-32.679
11925	8.50	$23.50	22,373	13	100.000	1.03000	$15,772.97	673.1	652.5	20.6	25.944	50.000	-24.056
11925	13.00	$26.22	3,597	4	100.000	1.03000	$2,829.40	648.8	652.5	-3.7	27.195	50.000	-22.805
11925	13.00	$26.22	44,321	25	100.000	1.03000	$34,862.90	685.2	652.5	32.7	28.957	50.000	-21.043
11925	13.00	$26.22	37,886	6	100.000	1.03000	$29,801.13	691.7	652.5	39.2	29.269	50.000	-20.731
11925	13.00	$26.22	29,175	5	100.000	1.03000	$22,949.06	677.0	652.5	24.5	37.182	50.000	-12.818
11925	13.00	$26.22	15,413	7	100.000	1.03000	$12,123.87	758.6	652.5	106.1	40.074	50.000	-9.926
11925	13.00	$26.22	45,884	25	100.000	1.03000	$36,092.35	737.6	652.5	85.1	40.521	50.000	-9.479
11925	13.00	$26.22	40,582	17	100.000	1.03000	$31,921.80	789.4	652.5	136.9	42.311	50.000	-7.689
11925	13.00	$26.22	94,179	39	99.992	1.02995	$73,967.57	757.4	652.5	104.9	54.070	50.000	4.070
11925	13.00	$26.22	143,663	59	99.982	1.02989	$112,598.69	686.7	652.5	34.2	34.411	50.000	-15.589
11925	13.00	$26.22	51,910	22	99.872	1.02945	$40,089.08	690.0	652.5	37.5	43.916	50.000	-6.084

2002 Totals

				Quality Level	Pay Factor	I/DP	Mean	TV	X - TV	St. Dev	V	StDev - V
Processes: 15			**Best:**	100.000	1.03000	$112,598.69	789.4	652.5	136.9	8.660	50.000	-41.340
Tests: 237			**Worst:**	99.872	1.02945	$982.07	632.5	652.5	-20.0	54.070	50.000	4.070
SY: 546,334			**Weighted Ave.:**	99.982	1.02991	$28,374.12	711.6	652.5	59.1	38.279	50.000	-11.721

2003 Flexural Strength

Subacct.	Item (inch)	Orig. Unit Price	Quant. SY	Tests	Quality Level	Pay Factor	I/DP	Mean	TV = LSL + (V * 1.65) TV	X - TV	St Dev	V	StD Dev - V
13897	8.00	$31.00	3,072	10	100.000	1.03000	$2,856.96	693.5	652.5	41.0	33.421	50.000	-16.579
13529	8.00	$21.10	123,166	17	99.911	1.02962	$76,979.93	632.9	652.5	-19.6	23.188	50.000	-26.812
13831	12.50	$27.25	92,389	45	98.128	1.01877	$47,246.55	694.7	652.5	42.2	61.074	50.000	11.074
13897	10.00	$24.00	43,023	31	94.860	0.99905	($979.29)	683.2	652.5	30.7	70.386	50.000	20.386

2003 Totals

				Quality Level	Pay Factor	I/DP	Mean	TV	X - TV	St. Dev	V	StDev - V
Processes: 4			**Best:**	100.000	1.03000	$76,979.93	694.7	652.5	42.2	23.188	50.000	-26.812
Tests: 103			**Worst:**	94.860	0.99905	($979.29)	632.9	652.5	-19.6	70.386	50.000	20.386
SY: 261,650			**Weighted Ave.:**	98.452	1.02077	$31,526.04	663.7	652.5	11.2	44.446	50.000	-5.554

Totals: 1/1/2000 to 12/31/2004.

			Quality Level	Pay Factor	I/DP	Mean	TV	X - TV	St. Dev	V	StDev - V
Projects:	9										
Processes:	35	**Best:**	100.000	1.03000	$182,487.27	789.4	652.5	136.9	8.660	50.000	-41.340
Tests:	552	**Worst:**	74.096	0.90964	($4,522.63)	601.9	652.5	-50.6	70.386	50.000	20.386
SY:	1,937,208	**Weighted Ave.:**	99.524	1.02756	$38,328.59	695.5	652.5	43.0	39.231	50.000	-10.769

Appendix B

2004 Projects

Project Data

Criteria: Projects with Start Dates from 1/1/04 to 12/31/04.

13885 *NH 0821-064*   **Glenwood Springs**   *Region: 3*   **Supplier: 20**

Start Date: 9/18/2004   *Bid Date: 6/3/2004*   *Criteria: Comp*   *Units: USA*   *Total Bid: $3,172,912.70*

Thickness

$$TV = PT + (V * 0.65)$$

Proc. No.	Item in/mm	Price	Quant	Tests	QL	PF	I/DP	Mean	TV	Mean - TV	St Dev	V	Std. Dev. - V
1	10.00	$45.00	31,097	10	99.999	1.02000	$27,983.29	10.400	10.260	0.140	0.293	0.400	-0.107

Compresive Strength

$$TV = LSL + (V * 1.65)$$

Proc. No.	Item in/mm	Price	Quant	Tests	QL	PF	I/DP	Mean	TV	Mean - TV	St Dev	V	Std Dev - V
1	10.00	$45.00	31,097	10	100.000	1.02000	$27,985.90	6,912.000	4,860.000	2,052.000	689.119	400.000	289.119

Sand Equivalent

$$TV = LSL + (V * 1.65)$$

Proc.	Item in/mm	Price	Quant	Tests	QL	PF	I/DP	Mean	TV	X - TV	St Dev	V	St Dev - V
1	10.00	$45.00	31,097	10	99.491	1.00928	$12,979.41	83.70	86.60	-2.90	1.703	4.000	-2.297

Project Totals: 13885

	Tests:	Quant:	IDP:
Thickness	10	31,097	$27,983.29
Comp Str.	10	31,097	$27,985.90
Sand Equivalent	10	31,097	$12,979.41
Flexural St.			
Plan Quant:		34,170	$68,948.60

Sum of Quantities:	93,291.0
Ave Quant:	31,097
Ave Price from Thickness:	$45.00

Project I/DP   *Ave Price*   *Ave Tons*

CPFC ($68,948.60 **/ (** $45.00 *****   31,097 **)) + 1 = 1.04927**

Comments:

13967   *IM 0252-359*   **Castle Pines Interchange**   *Region: 1*   *Supplier: 12*

Start Date: 9/10/2004   *Bid Date: 2/26/2004*   *Criteria: Comp*   *Units: USA*   *Total Bid: $6,773,273.49*

Thickness

$TV = PT + (V * 0.65)$

Proc. No.	Item in/mm	Price	Quant	Tests	QL	PF	I/DP	Mean	TV	Mean - TV	St Dev	V	Std. Dev. - V
1	8.50	$28.00	35,903	14	98.494	1.01570	$15,778.12	8.843	8.760	0.083	0.369	0.400	-0.031
2	12.50	$38.00	12,892	5	100.000	1.02000	$9,795.47	12.600	12.760	-0.160	0.122	0.400	-0.278

Compresive Strength

$TV = LSL + (V * 1.65)$

Proc. No.	Item in/mm	Price	Quant	Tests	QL	PF	I/DP	Mean	TV	Mean - TV	St Dev	V	Std Dev - V
1	8.50	$28.00	35,903	23	98.550	1.01586	$15,938.84	5,168.700	4,860.000	308.700	463.753	400.000	63.753
2	12.50	$38.00	12,892	10	91.539	0.99109	($4,363.69)	5,508.000	4,860.000	648.000	975.315	400.000	575.315

Sand Equivalent

$TV = LSL + (V * 1.65)$

Proc.	Item in/mm	Price	Quant	Tests	QL	PF	I/DP	Mean	TV	X - TV	St Dev	V	St Dev - V
1	8.50	$28.00	35,903	33	96.728	1.00346	$3,474.70	87.90	86.60	1.30	4.376	4.000	0.376
2	12.50	$38.00	12,892	11	97.019	1.00574	$2,813.25	87.80	86.60	1.20	4.446	4.000	0.446

Project Totals: 13967

	Tests:	Quant:	IDP:
Thickness	19	48,795	$25,573.59
Comp Str.	33	48,795	$11,575.15
Sand Equivalent	44	48,795	$6,287.95
Flexural St.			
Plan Quant:		48,418	$43,436.69

Sum of Quantities: 146,385.0
Ave Quant: 48,795
Ave Price from Thickness: $30.64

Project I/DP   Ave Price   Ave Tons

CPFC   ($43,436.69 **/ (** $30.64 ***** 48,795 **)) + 1 = 1.02905**

Comments:

14242 *STA 0831-089* *SH 83 Arapahoe to Orchard* *Region: 6* *Supplier: 5*

Start Date: 8/14/2004 *Bid Date: 2/26/2004* *Criteria: Comp* *Units: USA* *Total Bid: $3,218,889.89*

Thickness

TV = PT + (V * 0.65)

Proc. No.	Item in/mm	Price	Quant	Tests	QL	PF	I/DP	Mean	TV	Mean - TV	St Dev	V	Std. Dev. - V
1	6.00	$19.06	70,293	16	100.000	1.02000	$26,787.55	6.929	6.260	0.669	0.285	0.400	-0.115
2	6.00	$19.06	35,390	12	100.000	1.02000	$13,486.57	6.838	6.260	0.578	0.343	0.400	-0.057
3	6.00	$19.06	2,092	4	100.000	1.02000	$797.07	6.827	6.260	0.567	0.345	0.400	-0.055

Compresive Strength

TV = LSL + (V * 1.65)

Proc. No.	Item in/mm	Price	Quant	Tests	QL	PF	I/DP	Mean	TV	Mean - TV	St Dev	V	Std Dev - V
1	6.00	$19.06	32,558	6	99.763	1.01953	$12,114.02	4,710.000	4,860.000	-150.000	264.877	400.000	-135.123
2	6.00	$19.06	32,552	8	99.852	1.01970	$12,221.47	5,135.000	4,860.000	275.000	423.961	400.000	23.961
3	6.00	$19.06	13,245	7	80.160	0.94409	($14,111.64)	4,370.000	4,860.000	-490.000	195.874	400.000	-204.126
4	6.00	$19.06	21,656	6	100.000	1.02000	$8,253.17	5,028.300	4,860.000	168.300	282.872	400.000	-117.128
5	6.00	$19.06	5,672	4	100.000	1.02000	$2,161.08	5,450.000	4,860.000	590.000	679.166	400.000	279.166
6	6.00	$19.06	2,092	4	100.000	1.02000	$797.07	5,180.000	4,860.000	320.000	260.128	400.000	-139.872

Sand Equivalent

TV = LSL + (V * 1.65)

Proc.	Item in/mm	Price	Quant	Tests	QL	PF	I/DP	Mean	TV	X - TV	St Dev	V	St Dev - V
1	6.00	$19.06	32,558	6	100.000	1.01000	$6,203.98	91.30	86.60	4.70	1.751	4.000	-2.249
2	6.00	$19.06	32,552	8	100.000	1.01000	$6,202.84	89.10	86.60	2.50	0.991	4.000	-3.009
3	6.00	$19.06	13,245	6	100.000	1.01000	$2,523.86	89.80	86.60	3.20	1.169	4.000	-2.831
4	6.00	$19.06	21,656	6	100.000	1.01000	$4,126.59	90.50	86.60	3.90	0.837	4.000	-3.163
5	6.00	$19.06	5,672	4	100.000	1.01000	$1,080.81	90.80	86.60	4.20	0.500	4.000	-3.500
6	6.00	$19.06	2,092	4	100.000	1.01000	$398.63	90.50	86.60	3.90	0.577	4.000	-3.423

Project Totals: 14242

	Tests:	Quant:	IDP:		
Thickness	32	107,775	$41,071.19	Sum of Quantities:	323,325.0
Comp Str.	35	107,775	$21,435.17	Ave Quant:	107,775
Sand Equivalent	34	107,775	$20,536.71	Ave Price	
Flexural St.				from Thickness:	$19.06
Plan Quant:		108,473	$83,043.07		

Project I/DP   *Ave Price*   *Ave Tons*

CPFC **(** $83,043.07 **/ (** $19.06 ***** 107,775 **)) + 1 =** **1.04043**

Comments: Strength and SE processes?

14342   *STA 012A-039*   *SH 12 Extension in Trinid*   *Region: 2*   *Supplier: 18*

Start Date: 4/9/2004   *Bid Date: 6/19/2003*   *Criteria: Comp*   *Units: USA*   *Total Bid: $4,338,501.74*

Thickness

TV = PT + (V * 0.65)

Proc. No.	Item in/mm	Price	Quant	Tests	QL	PF	I/DP	Mean	TV	Mean - TV	St Dev	V	Std. Dev. - V
1	9.00	$47.88	13,600	17	99.729	1.01923	$12,519.14	9.618	9.260	0.358	0.408	0.400	0.008

Compresive Strength

TV = LSL + (V * 1.65)

Proc. No.	Item in/mm	Price	Quant	Tests	QL	PF	I/DP	Mean	TV	Mean - TV	St Dev	V	Std Dev - V
1	9.00	$47.88	13,600	17	98.407	1.01545	$10,059.81	5,397.100	4,860.000	537.100	591.669	400.000	191.669

Sand Equivalent

TV = LSL + (V * 1.65)

Proc.	Item in/mm	Price	Quant	Tests	QL	PF	I/DP	Mean	TV	X - TV	St Dev	V	St Dev - V
1	9.00	$47.88	13,600	17	100.000	1.01000	$6,511.68	94.20	86.60	7.60	1.185	4.000	-2.815

Project Totals: 14342

	Tests:	Quant:	IDP:
Thickness	17	13,600	$12,519.14
Comp Str.	17	13,600	$10,059.81
Sand Equivalent	17	13,600	$6,511.68
Flexural St.			
Plan Quant:	4,457		$29,090.63

Sum of Quantities: 40,800.0

Ave Quant: 13,600

Ave Price from Thickness: $47.88

Project I/DP   *Ave Price*   *Ave Tons*

CPFC **(** $29,090.63 **/ (** $47.88 ***** 13,600 **)) + 1 =** **1.04467**

Comments:

14948   *IM 0701-168*   **Rifle to Silt Slab Repair**   *Region: 3*   *Supplier: 20*

Start Date: 10/4/2004   *Bid Date: 8/5/2004*   *Criteria: Comp*   *Units: USA*   *Total Bid: $1,349,754.00*

Thickness
$TV = PT + (V * 0.65)$

Proc. No.	Item in/mm	Price	Quant	Tests	QL	PF	I/DP	Mean	TV	Mean - TV	St Dev	V	Std. Dev. - V
1	8.00	$53.43	10,580	10	100.000	1.02000	$11,305.22	8.340	8.260	0.080	0.143	0.400	-0.257

Compresive Strength
$TV = LSL + (V * 1.65)$

Proc. No.	Item in/mm	Price	Quant	Tests	QL	PF	I/DP	Mean	TV	Mean - TV	St Dev	V	Std Dev - V
1	8.00	$53.43	10,580	10	100.000	1.02000	$11,305.22	6,544.000	4,860.000	1,684.000	412.505	400.000	12.505

Sand Equivalent
$TV = LSL + (V * 1.65)$

Proc.	Item in/mm	Price	Quant	Tests	QL	PF	I/DP	Mean	TV	X - TV	St Dev	V	St Dev - V
1	8.00	$53.43	10,580	10	99.146	1.00878	$4,965.07	84.50	86.60	-2.10	2.173	4.000	-1.827

Project Totals: 14948

	Tests:	Quant:	IDP:
Thickness	10	10,580	$11,305.22
Comp Str.	10	10,580	$11,305.22
Sand Equivalent	10	10,580	$4,965.07
Flexural St.			
Plan Quant:	11,312		$27,575.51

Sum of Quantities: 31,740.0
Ave Quant: 10,580
Ave Price from Thickness: $53.43

Project I/DP   Ave Price   Ave Tons

CPFC   ($27,575.51 **/ (** $53.43 ***** 10,580 **)) + 1 =** **1.04878**

Comments: Slab Repair

2004   Number of Projects   5