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PORTLAND CEMENT CONCRETE PAVEMENT REVIEW OF QC/QA DATA 2000 THROUGH 2009

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COLORADO DEPARTMENT OF TRANSPORTATION
DTD APPLIED RESEARCH AND INNOVATION BRANCH

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16. Abstract

This report analyzes the Quality Control/Quality Assurance (QC/QA) data for Portland cement concrete pavement (PCCP) awarded in the years 2000 through 2009. Analysis of the overall performance of the projects is 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 is also completed. The results of the evaluation are presented in tables, figures, and reports.

The overall quality of PCCP evaluated is very high. The quality levels in each of the elements are approaching the maximum of 100%. The pay factors for the individual elements are also close to their maximums. The material being produced is well above the minimum standards set by the specifications.

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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 2000, it was released as a Standard Special Provision.

This report summarizes 10 years of the QC/QA data for PCCP projects. Detailed information given for the years 2000 through 2009 are guided by "Standard Specification for Road and Bridge Construction" books of 2005 and 2011. 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, and flexural strength are evaluated. Charts comparing the quality level and pay factor information for the years 2000 through 2009 are displayed for each of the test elements.

The major data grouping used in the report is by start date. 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 the contractor. On numerous projects the paving did not begin in the same year as the project was awarded. In a couple of cases the paving began two years after the project was awarded. This grouping was used to improve the analysis of the projects according to when the paving began.

This report includes some metric projects, SI units. The data for these projects has been converted to the USA equivalent unit. Evaluations were completed using all of the projects in USA equivalent units instead of splitting the projects into the two different data measurements.

2.0 SPECIFICATIONS

Specification –Subsection 105.06, Conformity to the Contract of Portland Cement Concrete Pavement, of the *Standard Specifications 2005,* govern all of the QC/QA calculations used for Portland cement concrete pavements. All future reports will be governed by Subsection 105.06, of the "Standard Specification for Road and Bridge Construction" book of 2011. Per standard special provision, dated April 30, 2009 and addressed in CDOT Standard Specifications for Road and Bridge 2011 edition, sand equivalence will no longer be a criteria. The revised criteria for compressive strength will consist of compressive strength and pavement thickness. The flexural strength criteria are the elements of flexural strength and pavement thickness. The Concrete 03 computer program is based on this specification.

All of 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. 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.

Prior to April 30, 2009, when compressive strength criteria was used, the calculations for I/DP were based on the results of the following elements: thickness, sand equivalent and compressive strength. The maximum incentive payment for compressive strength element was 5 percent. With the deletion of sand equivalent, it was reduced to 4 percent.

When flexural strength criteria is used the calculations for I/DP will be based on the following two elements: thickness and flexural strength. The maximum incentive payment for the PCCP is 5 percent.

The maximum pay factor for each of the test elements, prior to April 30, 2009, is listed in Table 1. These will be changed on all future reports to reflect the deletion of the sand equivalent. The maximum pay factor for each of the test elements, following the April 30, 2009 revision, is listed in Table 2.

Table 1. Maximum Pay Factor for Test Elements

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

Pay factors are calculated for each process that contains more than two tests using the following equations:

A. For compressive strength and pavement thickness:

When $3 < Pn < 5$

If $QL > 85$, then $PF = 1.00 + (QL - 85)0.001333$

If $QL < 85$, then $PF = 1.00 + (QL - 85)0.005208$

When $6 < Pn < 9$

If $QL > 90$, then $PF = 1.00 + (QL - 90)0.002000$

If $QL < 90$, then $PF = 1.00 + (QL - 90)0.005682$

When $10 < Pn < 25$

If $QL > 93$, then $PF = 1.00 + (QL - 93)0.002857$

If $QL < 93$, then $PF = 1.00 + (QL - 93)0.006098$

When $Pn > 26$

If $QL > 95$, 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 < Pn < 5

If QL > 85, then PF = 1.00 + (QL - 85)0.002000

If QL < 85, then PF = 1.00 + (QL - 85)0.005208

When 6 < Pn < 9

If QL > 90, then PF = 1.00 + (QL - 90)0.003000

If QL < 90, then PF = 1.00 + (QL - 90)0.005682

When 10 < Pn < 25

If QL > 93, then PF = 1.00 + (QL - 93)0.004286

If QL < 93, then PF = 1.00 + (QL - 93)0.006098

When Pn > 26

If QL > 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 < Pn < 5

If QL > 85, then PF = 1.00 + (QL - 85)0.000667

If QL < 85, then PF = 1.00 + (QL - 85)0.005208

When 6 < Pn < 9

If QL > 90, then PF = 1.00 + (QL - 90)0.001000

If QL < 90, then PF = 1.00 + (QL - 90)0.005682

When 10 < Pn < 25

If QL >93, then PF = 1.00 + (QL - 93)0.001429

If QL < 93, then PF = 1.00 + (QL - 93)0.006098

When Pn > 26

If QL > 95, then PF = 1.00 + (QL - 95)0.002000

If QL < 95, then PF = 1.00 + (QL - 95)0.006757

Sand equivalent process calculation, as shown above in “C”, is no longer a valid process of the compressive strength criteria. Table 2 will replace Table 1 on all future reports.

Table 2. Maximum Pay Factor for Test Elements

Element	Maximum Pay Factor
Thickness	**2 percent**
Compressive Strength	**2 percent**
Flexural Strength	**3 percent**

A. For compressive strength and pavement thickness:

When 3 < Pn < 5

If QL > 85, then PF = 1.00 + (QL - 85)0.001333

If QL < 85, then PF = 1.00 + (QL - 85)0.005208

When 6 < Pn < 9

If QL > 90, then PF = 1.00 + (QL - 90)0.002000

If QL < 90, then PF = 1.00 + (QL - 90)0.005682

When 10 < Pn < 25

If QL > 93, then PF = 1.00 + (QL - 93)0.002857

If QL < 93, then PF = 1.00 + (QL - 93)0.006098

When Pn > 26

If QL > 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 < Pn < 5

If QL > 85, then PF = 1.00 + (QL - 85)0.002000

If QL < 85, then PF = 1.00 + (QL - 85)0.005208

When 6 < Pn < 9

If QL > 90, then PF = 1.00 + (QL - 90)0.003000

If QL < 90, then PF = 1.00 + (QL - 90)0.005682

When 10 < Pn < 25

If QL > 93, then PF = 1.00 + (QL - 93)0.004286

If QL < 93, then PF = 1.00 + (QL - 93)0.006098

When Pn > 26

If QL > 95, then PF = 1.00 + (QL - 95)0.006000

If QL < 95, then PF = 1.00 + (QL - 95)0.006757

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

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

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

The total I/DP for an element is 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 2000. The calculation for quality levels has remained unchanged since 1994.

3.0 CALCULATIONS AND DEFINITIONS

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

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, such as processes with less than three tests. The calculation 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.

Small Quantities Calculation:

When it is necessary to represent a process by only one or two test results, PF will be the average of PFs resulting from the following:

If the test result is within the tolerance limits then PF = 1.00.

If the test result is above the maximum specified limit, then PF = 1.00 – $[0.25(T_o – T_u)/V]$.

If the test result is below the minimum specified limit, then PF = 1.00 – $[0.25(T_L – T_o)/V]$.

The calculated PF will be used to determine the I/DP for the process.

Incentive/Disincentive Payment (I/DP) - 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.

Mean - Is the mathematical average of a set of numbers. The average is calculated by adding up two or more scores and dividing the total by the number of scores.

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.

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.

Plan Thickness (PT) – The thickness of the pavement as shown in the project's plan. 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.

Process Quantities – Process quantities are used for all calculations in this report except for the calculation of the Calculated Pay Factor Composite. Please see subsections 105.06, "Conformity to Contract of Portland Cement Concrete Pavement" of the Standard Specifications for details on processes.

Quality Level – 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. Quality levels (Percent within limits) are calculated in accordance with Colorado Procedure 71.

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

Standard Deviation (Std. Dev.) - A statistical measure of spread or variability. The standard deviation is the root mean square (RMS) deviation of the values from their arithmetic mean.

equation: $$s = \sqrt{\frac{\sum (X - \overline{X})^2}{n - 1}}$$

Standard Deviation minus the V Factor (Std. Dev. – V) - 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 standard deviation for the process is one of the two factors that affect the calculation for quality level.

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

T_L – Lower Specification Limit.

T_O – Individual Test Result

T_U – Upper Specification Limit

Target Value (TV) - A calculated value for the mean of a process which would result in 85 percent 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, 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.

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

Variance - A measure of the average distance between each of a set of data points and their mean value; equal to the sum of the squares of the deviation from the mean value. The square root of the variance is the standard deviation.

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 for analysis in this report. The calculation for Calculated Pay Factor Composite was completed using the original unit of measurement. The following conversion factors were used:

Table 3. 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 ANALYSIS OF THE DATA

A Calculated Pay Factor Composite (CPFC) is calculated for each project. The CPFC gives an index of the overall quality of the PCCP. Each project will have an overall incentive/disincentive payment (I/DP) calculated. The I/DP is the incentive or disincentive amount the project received for the PCCP. Each of the test elements is also evaluated: thickness, compressive strength, sand equivalent and flexural strength. An I/DP is also 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. Quality levels are not calculated on processes that contain less than three test results because a Standard Deviation cannot be determined. Therefore, these processes are excluded from the analysis containing quality level calculations

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.

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.

The best or worst results displayed are not necessarily 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.

6.0 DISCUSSION OF THE DATA

6.1 Projects Evaluated

Table 4 displays the number of projects and amount of material awarded and evaluated by bid date, as well as by start date. The start date is defined as the date on which the PCCP paving 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 the project was awarded to contract.

A relatively small number of projects are included in some of the data groupings, especially those that were constructed using flexural strength criteria. None of the yearly groupings for flexural strength contained more than four projects. Overall, five of the twenty element data groupings contained three or less projects. Additional project data will be added to the database as they are received by the Pavement Design Unit.

Table 4. Projects Evaluated by Bid Date and Start Date

	Awarded			Evaluated by bid date/Criteria				Evaluated by Start Date			
				Compressive Str.		Flexural Str.		Compressive Str.		Flexural Str.	
Year	Projects	SY/m2		Projects Bid	SY/m2	Projects Bid	SY/m2	Projects Started	SY/m2	Projects Started	SY/m2
2000	15	2,460,095		9	1,350,974	4	940,012	3	357,612	1	197,453
2001	11	1,907,658		8	700,954	2	789,433	8	1,074,862	4	975,836
2002	7	682,255		4	175,674	2	234,921	7	655,498	1	556,156
2003	11	815,070		6	273,361	5	529,129	7	339,607	3	274,352
2004	8	420,564		5	207,931	2	201,909	6	275,757	4	504,725
2005	10	513,683		3	152,124	4	336,876	3	93,997	2	186,882
2006	9	1,035,066		6	86,463	3	678,560	4	83,354	4	336,876
2007	9	1,085,757		6	420,418	2	513,247	7	179,950	3	678,560
2008	14	1,468,282		4	191,727	2	270,265	6	498,989	4	783,512
2009	20	1,799,340		4	443,311	2	271,635	4	443,311	4	213,856

6.2 Calculated Pay Factor Composite

The Calculated Pay Factor Composite (CPFC) is an index of 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 projects. 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 PCCP. From 2000 to 2009, eighty one projects have been evaluated. On average, all projects have high quality levels and earned close to the maximum incentive. Four of the 81 projects (4.9 percent) were in the 3.0 to 3.5 range. Twenty-two projects (27.2 percent) were in the 3.5 to 3.9 range. Fourteen projects (17.3 percent) were in the 4.0 to 4.1 range. Twenty-six projects (32.1 percent) were in the 4.2 to 4.5 range. And, 15 projects (18.5 percent) were in the 4.6 to 5.0 range. Only 3 of the projects evaluated failed to receive some amount of incentive payment.

A recap of the yearly CPFC information for the years 2000 through 2009 is displayed in Table 6. All information in Table 6 is displayed in numerical data and in bar graph form. The information is first displayed by testing criteria: compressive strength or flexural strength. The information for all projects, both criteria combined, is displayed at the end of Table 6. When evaluating the projects by their testing criteria we find that both criteria are performing equally well. All of the yearly averages except one are above 3.0 percent incentive. Only in 2003 did the yearly average for the flexural strength projects fall below 3.0 percent, calculated at 2.99 percent.

The yearly CPFC averages 2000 to 2009 for compressive strength, flexural strength, and all projects combined are displayed in Figures 1, 2, and 3. CPFC on compressive strength projects has gradually increased over the time period. In the year 2000, the average CPFC for compressive strength was 99.241. In 2009, the average CPFC was 99.650, this is an increase of 0.409 over the span of 10 years.

Flexural strength CPFC has also increased over the time period, with a positive difference calculated at 1.376 from 2000 to 2009. A consistent increase in the CPFC is seen in the flexural strength projects.

The CPFC for all projects combined is displayed in Figure 3. The CPFC tracking from 2000 to 2009, for all projects combined is essentially flat with the slightest negative movement, calculated at -0.0002. Also of importance is to evaluate how close the projects are to approaching the maximum incentive of 5.0 percent. In years 2001, 2007 and 2009, compressive strength dipped below 1.04. All other yearly results have been above 1.04. The majority of the projects are reporting good test results and receiving pay factors that are close to the maximum allowable limits.

Table 5. Percentage of Projects Earning Specified CPFCs

	2000 – 2009 81 Projects	
CPFC Equal To Or Greater Than (Percentage)	**Count**	**Percentage**
4.6 to 5.0	15	18.5 percent
4.2 to 4.5	26	32.1 percent
4.0 to 4.1	14	17.3 percent
3.5 to 3.9	22	27.2 percent
3.0 to 3.5	4	4.9 percent
1.0 to 2.9	0	0

Table 6. Calculated Pay Factor Composite by Year

Compressive Strength Projects			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	7	679,494	1.04343	1.02543	1.05000
2003	7	358,759	1.04664	1.01008	1.05000
2004	6	280,597	1.04156	1.02905	1.04927
2005	3	94,047	1.04256	0.89336	1.04874
2006	4	96,860	1.04420	1.04102	1.04999
2007	7	174,175	1.03126	0.98449	1.04999
2008	6	346,409	1.04161	0.97190	1.04986
2009	3	260,092	1.01923	1.01441	1.04842
2000 – 2009	54	3,839,241	1.038608	1.00025	1.04958

Flexural Strength Projects **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	4	498,423	1.03937	1.03293	1.04741
2005	2	182,316	1.04877	1.04815	1.04940
2006	4	337,982	1.04199	1.02858	1.05000
2007	3	677,123	1.04639	1.04416	1.04995
2008	4	782,290	1.04934	1.04761	1.05000
2009	1	211,558	1.04800	1.04859	1.04859
2000 – 2009	27	4,693,778	1.043227	1.03862	1.04711

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	8	1,242,695	1.04335	1.02543	1.05000
2003	10	634,947	1.03934	1.01008	1.05000
2004	10	779,020	1.04016	1.02905	1.04927
2005	5	276,363	1.04666	0.89336	1.04940
2006	8	434,842	1.04248	1.02858	1.05000
2007	10	851,298	1.04329	0.98449	1.04999
2008	10	989,357	1.04697	0.97190	1.05000
2009	4	471,650	1.03214	1.01441	1.04842
2000 – 2009	81	8,533,019	1.04136	0.99901	1.04962

Figure 1. Compressive Strength, Calculated pay Factor Composite by Year

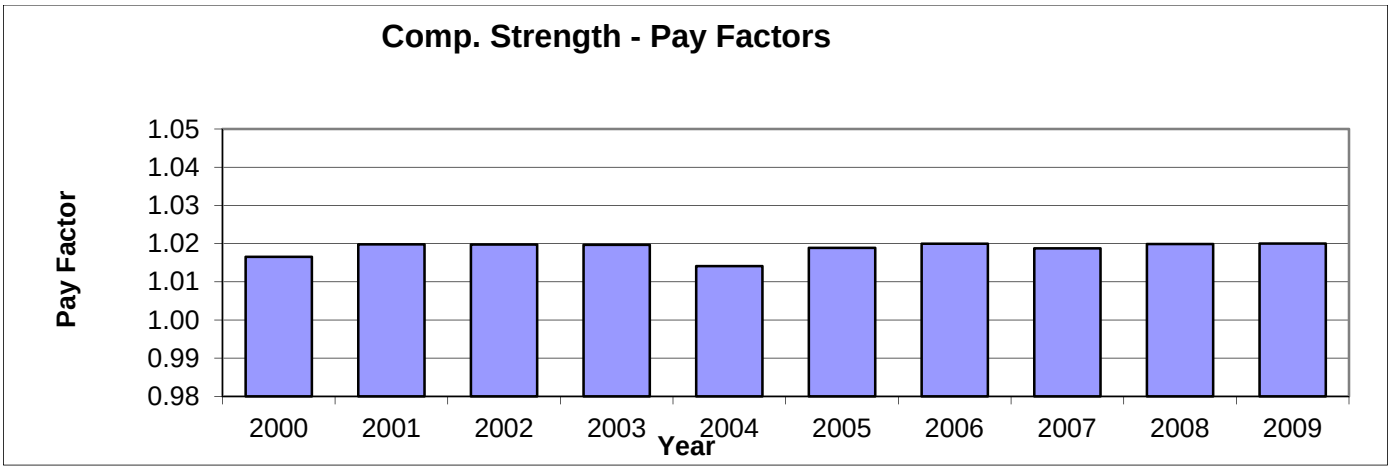


Figure 2. Flexural Strength, Calculated Pay Factor Composite by Year

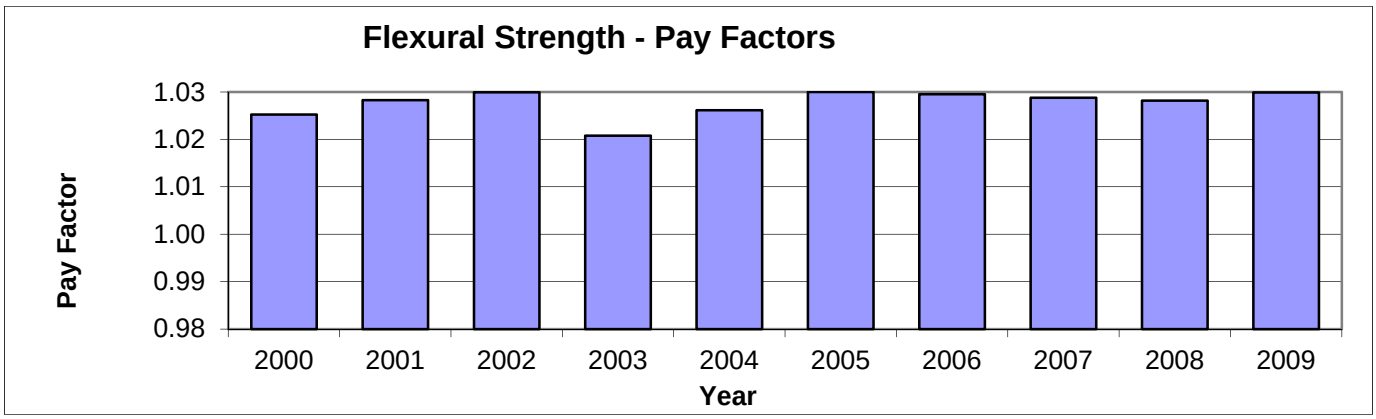
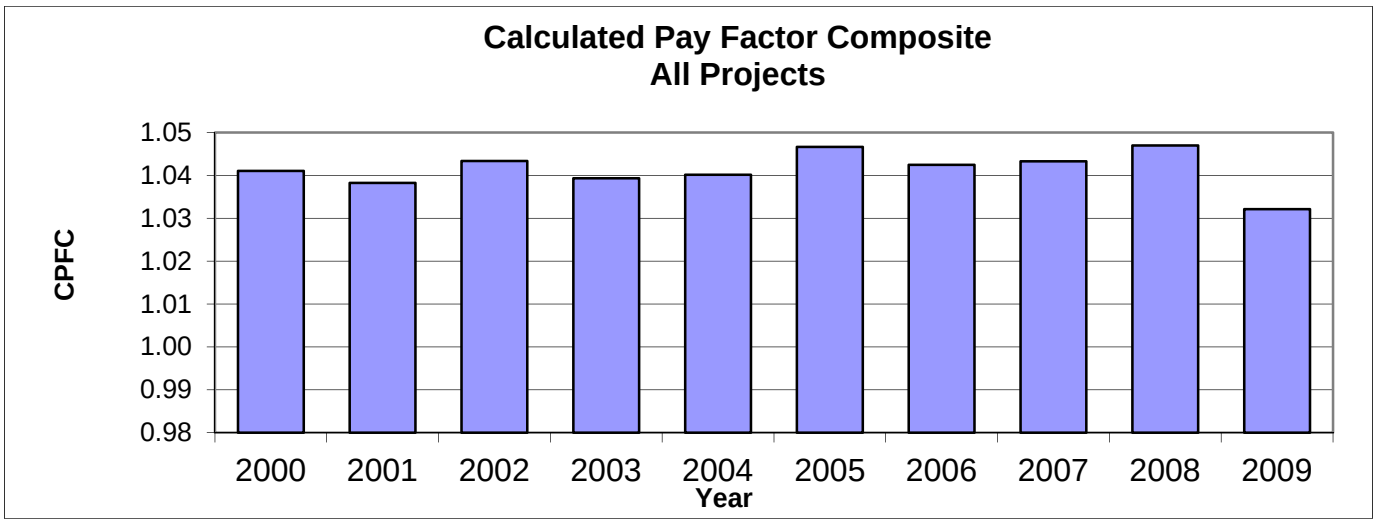


Figure 3. All Projects, Calculated Pay Factor Composite by Year



6.3 Incentive/Disincentive Payments

Additional information contained in Table 7 for each of the data groupings includes: the number of projects, the total square yards and average square yards, and the summation, average, minimum and maximum values for the I/DP information. A complete report showing the I/DP information is presented in Appendix A.

The calculation for I/DP is directly tied to the size of the project. The projects with the largest I/DP do not necessarily represent the projects with the best reported quality levels. The smaller I/DPs reported in some of the projects or years does not necessarily mean that they had lower quality. It is more likely due to the smaller size of the project. The average incentive for all projects evaluated from 2000 to 2009 is calculated at 4.1 percent, data from Table 6. This percentage has remained fairly constant over years 2000 to 2009. From 2000 to 2009 only three projects evaluated have failed to receive some amount of incentive payment. All three of the projects utilized compressive strength as the testing criteria. The first of these was constructed in 2005, the second project was constructed in 2007, and the third project was constructed in 2008.

Table 7. Incentive/Disincentive Payments – Compressive Strength by Year

Compressive Str.		Square Yards		Incentive/Disincentive Payment			
Year	Projects	Total	Average	Summation	Average	Minimum	Maximum
2000	3	411,488	137,163	$440,082.88	$146,694.29	$53,400.73	$276,907.26
2001	8	1,137,320	142,165	$950,230.67	$118,778.83	$15,464.53	$441,429.80
2002	7	679,494	97,071	$766,354.11	$109,479.16	$43,617.66	$338,330.82
2003	7	358,759	51,251	$487,952.84	$69,707.55	$3,772.66	$213,295.38
2004	6	280,597	46,766	$321,448.91	$53,574.82	$27,575.51	$83,043.07
2005	3	94,047	31,349	$137,260.92	$45,753.64	($18,780.42)	$139,392.14
2006	4	96,860	24,215	$189,590.94	$47,397.74	$10,344.54	$130,883.29
2007	7	174,175	24,882	$309,673.74	$44,239.11	($5,992.97)	$94,083.22
2008	6	346,409	57,734	93001.00	11625.13	(5866.01)	32996.98
2009	3	260,092	86,697	135,908.34	45,302.78	16,201.40	61,675.36

Table 8. Incentive/Disincentive Payments – Flexural Strength by Year

Flexural Strength		Square Yards		Incentive/Disincentive Payment			
Year	Projects	Total	Average	Summation	Average	Minimum	Maximum
2000	1	102,150	102,150	$114,488.88	$114,488.88	$114,488.88	$114,488.88
2001	4	1,062,547	265,637	$1,086,725.70	$271,681.44	$230,921.84	$306,074.51
2002	1	563,201	563,201	$634,618.54	$634,618.54	$634,618.54	$634,618.54
2003	3	276,188	92,063	$198,579.37	$66,193.12	$18,814.20	$97,410.14
2004	4	498,423	124,606	$498,975.19	$124,743.80	$81,156.65	$214,969.48
2005	2	182,316	91,158	$226,314.60	$113,157.30	$98,520.52	$127,794.08
2006	4	337,982	84,496	$446,488.95	$111,622.24	$44,056.54	$234,147.14
2007	3	677,123	225,708	$1,105,827.20	$368,609.08	$301,301.58	$462,433.38
2008	4	782,290	195,573	$1,327,296.77	$331,824.19	$170,636.44	$592,210.30
2009	1	211,558	211,558	$277,838.39	$277,838.39	$277,838.39	$277,838.39

Table 9. Incentive/Disincentive Payments – All Projects by Year

All Projects		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	$2,036,956.40	$169,746.37	$15,464.53	$441,429.80
2002	8	1,242,695	155,337	$1,400,972.60	$175,121.58	$43,617.66	$634,618.54
2003	10	634,947	63,495	$686,532.21	$68,653.22	$3,772.66	$213,295.38
2004	10	779,020	77,902	$820,424.10	$82,042.41	$27,575.51	$214,969.48
2005	5	276,363	55,273	$363,575.52	$72,715.10	($18,780.42)	$139,392.14
2006	8	434,842	54,355	$636,079.89	$79,509.99	$10,344.54	$234,147.14
2007	10	851,298	85,130	$1,415,500.90	$141,550.10	($5,992.97)	$462,433.38
2008	10	1,128,699	112,870	$1,896.844.44	$189,684.44	($5,886.01)	$592,210.30
2009	4	471,650	117,913	$413,746.73	$103,436.68	$16,201.40	$277,838.39

6.4 Recap of Data 2000 through 2009 - Thickness, Compressive Strength, and Flexural Strength

The results for each of the test elements for the years 2000 through 2009 are listed in Compressive Strength -Table 7, Flexural Strength – Table 8, and all Projects - Table 9. The quality level, pay factor, and standard deviation are shown for each element, in Table 10. The mean to target value and standard deviation minus V factor are also calculated. All PCCP test elements are lower limit only specifications. Negative numbers indicate that the mean is below the target value. Positive values show that the mean is above the target value. The higher calculated value 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.

Most of the material being produced throughout the 10 years evaluated have been within specification limits, with quality levels approaching 100 percent. Of all of the data groupings evaluated, only 2 of the 40 averages have a quality level that is less than 98 percent. The lowest reported quality level value is 96.42 percent in the sand equivalent element in 2008. The next lowest quality level, 97.90 percent, was recorded in the thickness element in 2001. Two of the 40 averages were 100 percent. Twenty-three of the 40 were equal to or above 99 percent. Twelve of the 40 quality level values were equal to or above 98 percent. Many of the element pay factors are approaching the maximum allowable values: sand equivalent 1 percent, thickness 2 percent, compressive strength 2 percent, and flexural strength 3 percent. In 2008 the average pay factor for sand equivalency fell to 99.46, just 00.53 below the maximum allowed. In 2009 sand equivalency increased to 1.00, the maximum allowed. The average pay factor recorded for thickness is 1.49, this is 00.50 less than the maximum. Compressive strength is 00.12 less than the maximum and flexural strength is 00.27 less than maximum. All of the elements are within 0.40 of the maximum allowable pay factors.

In Table 10, the mean to TV column shows the relationship of the material being produced to the element's target value. In general, the material cannot be out of specification on the upper end. Positive values in the mean to TV column indicate that the material is greater than the TV. Negative values in this column would indicate that the mean is below the element's target value, closer to the lower specification limits. 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 except for two: thickness in 2006 and sand equivalency in 2007. The material being produced has been consistently above the element's target value. This increases the likelihood that the material will be within specification limits. Another evaluation of the mean to target value calculations is to determine how much the mean is exceeding the target value. The mean is greater than 1V above the target value for each year in the compressive strength element. This element exceeds the specification limit by a wide margin allowing almost 100 percent of the material to be within the specification limits.

Overall, material is being produced that exceeds the target values resulting in the high quality levels. 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 last column. All of the values in this column are negative except for some of those in the compressive strength element. Thus, the material being produced has less variation than historically reported. The values in the compressive strength element are just slightly above its V value. The variation in this element is slightly above the historical values. However, this element has the highest 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 1 through 15 display the quality levels and pay factors for each of the elements.

Table 10. Thickness – Quality Level and Pay Factor by Year

Thickness

				Weighted Average					
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	8	1,217,438	408	98.682	1.01591	0.235	0.362	0.400	-0.038
2003	10	632,949	281	98.685	1.01499	0.226	0.342	0.400	-0.058
2004	9	777,520	286	98.728	1.01527	0.169	0.326	0.400	-0.074
2005	5	275,448	83	99.647	1.01920	0.024	0.161	0.400	-0.239
2006	8	425,796	207	98.062	1.01393	-0.048	0.202	0.400	-0.198
2007	10	845,120	301	99.152	1.01732	0.274	0.376	0.400	-0.024
2008	7	985,573	335	98.881	1.00934	0.375	0.296	0.400	-0.099
2009	5	581,760	234	98.877	1.01594	0.245	0.397	0.400	-0.003

Max 1.02000

Figure 4. Thickness, Quality Levels Bar Graph

Figure 5. Thickness, Pay Factors

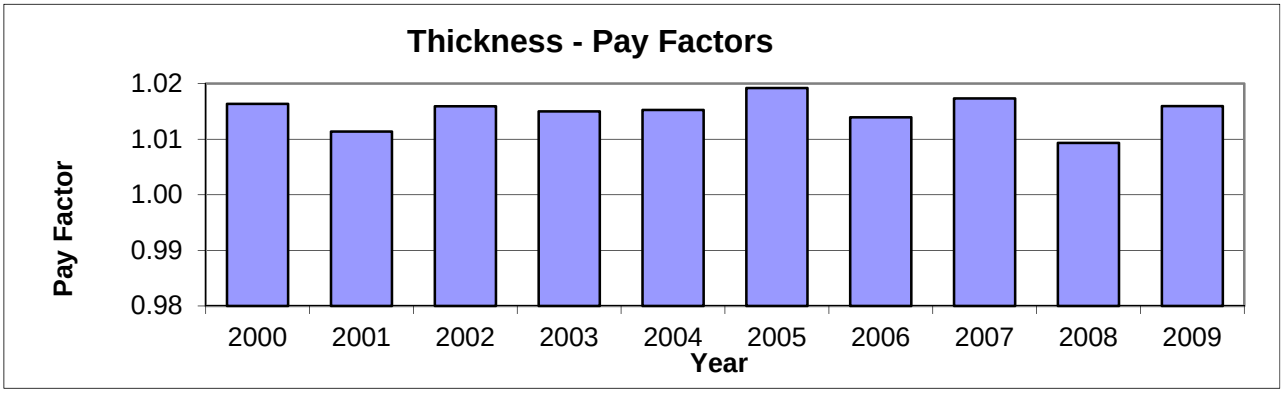


Table 11. Compressive Strength - Quality Level and Pay Factor by year

Compressive Strength

Year	Proj.	SY	Tests	Weighted Average 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	7	684,347	199	99.897	1.01975	1,133	518	400	118
2003	7	344,021	171	99.859	1.01969	912	363	400	-37
2004	5	272,741	126	98.320	1.01408	626	456	400	56
2005	3	93,132	46	99.718	1.01887	911	571	400	171
2006	4	93,920	105	99.988	1.01996	1,446	630	400	230
2007	7	176,596	197	99.536	1.01876	1,012	529	400	129
2008	6	498,989	72	99.963	1.01989	1,179	499	400	99
2009	4	443,311	127	99.997	1.01999	852	392	400	-8

Max 1.02000

Figure 6. Compressive Strength, Quality Levels

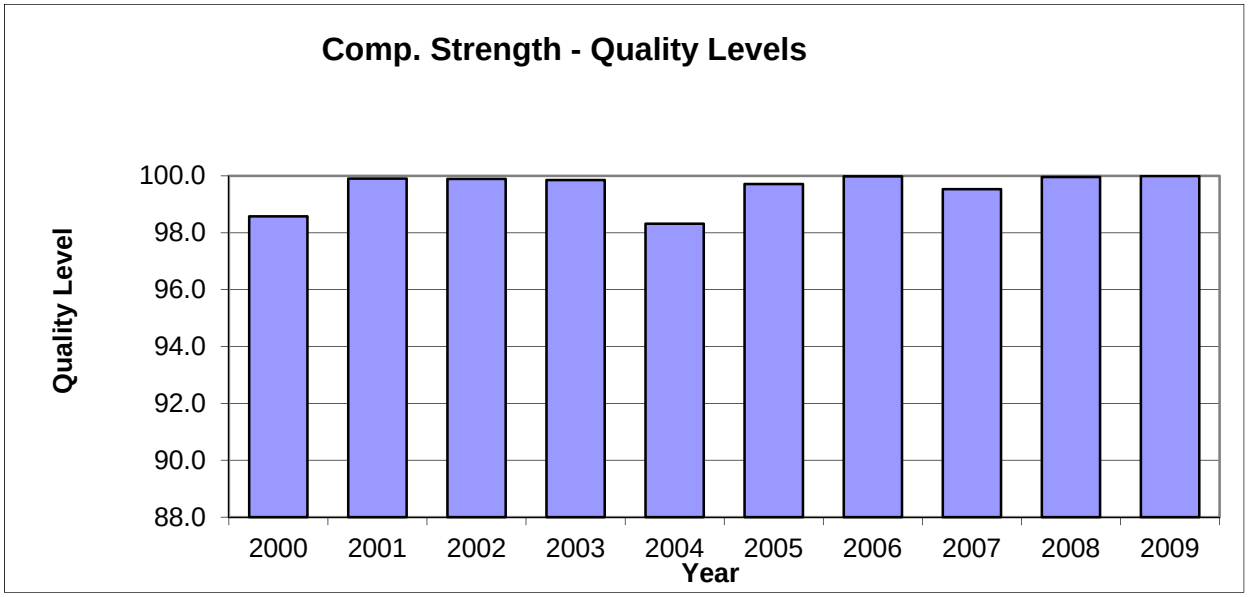


Figure 7. Compressive Strength, Pay Factors

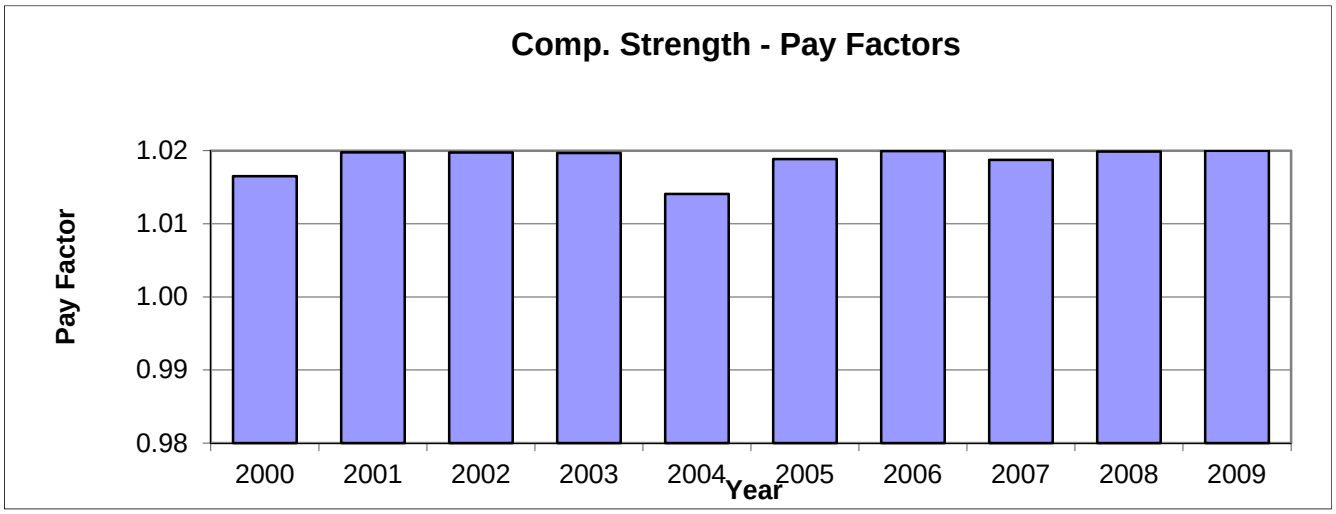


Table 12. Sand Equivalent – Quality Level and Pay Factor

Sand Equivalent

Year	Proj.	SY	Tests	Quality Level	Pay Factor	Weighted Average 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	7	614,347	173	99.920	1.00989	7.08	2.062	4.000	-1.938
2003	7	355,335	176	99.819	1.00981	4.87	1.829	4.000	-2.171
2004	5	280,597	138	99.356	1.00884	1.05	1.847	4.000	-2.153
2005	3	92,179	45	98.262	1.00485	4.57	2.772	4.000	-1.228
2006	4	93,920	105	100.000	1.01000	3.92	2.109	4.000	-1.891
2007	7	120,770	145	97.060	1.00337	-0.44	2.505	4.000	-1.495
2008	4	18,608	68	96.425	0.99463	7.69	2.327	4.00	-1.673
2009	2	36,914	44	97.801	1.01000	5.41	2.004	4.00	-1.996
					Max 1.01000				

Figure 8. Sand Equivalent, Pay Factors

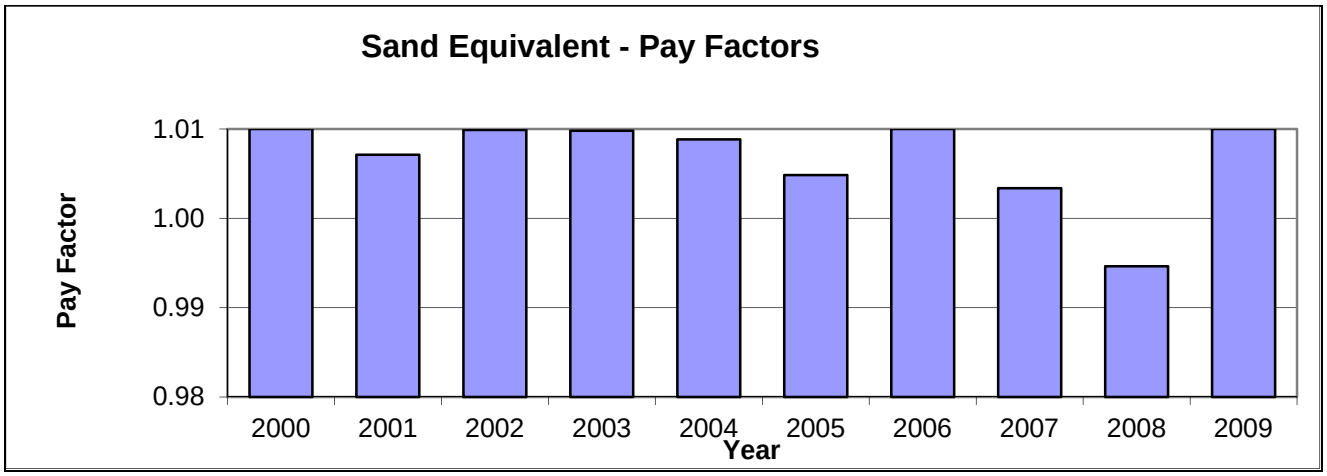


Table 13. Flexural Strength – Quality Level and Pay Factor

FLEXURAL STRENGTH

Year	Proj.	SY	Tests	Quality Level	Pay Factor	Weighted Average Mean to TV	St. Dev.	V	St. Dev. - V
2000	1	99,735	51	99.089	1.02524	16.13	39.966	50.000	-10.034
2001	4	1,029,489	161	99.596	1.02827	45.20	38.340	50.000	-11.660
2002	1	546,334	237	99.982	1.02991	59.09	38.279	50.000	-11.721
2003	3	261,650	103	98.452	1.02077	11.20	44.446	50.000	-5.554
2004	4	496,473	144	99.167	1.02616	47.69	37.449	50.000	-12.551
2005	2	182,316	82	100.000	1.03000	37.40	28.326	50.000	-21.674
2006	4	334,521	128	99.915	1.02951	105.10	46.478	50.000	-3.522
2007	3	661,666	127	99.798	1.02879	63.71	41.667	50.000	-8.333
2008	5	959.694	424	99.577	1.02817	73.5	43.465	50.00	-6.535
2009	2	211,558	25	99.972	1.02988	56.5	45.821	50.00	-4.179
					Max 1.03000				

Figure 9. Flexural Strength, Quality Levels

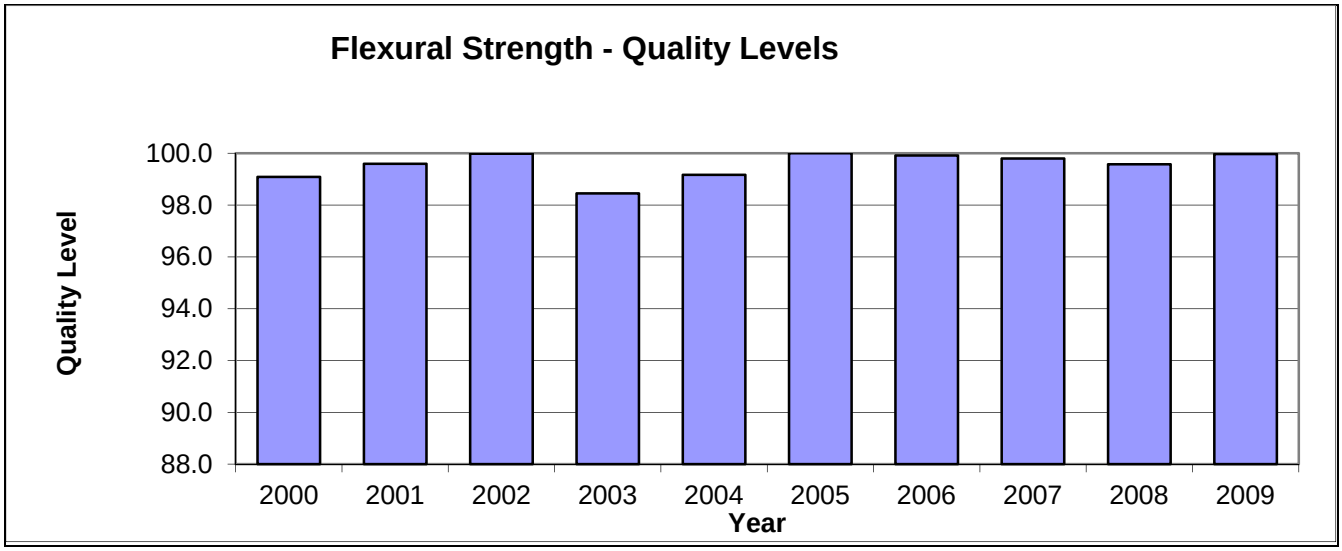
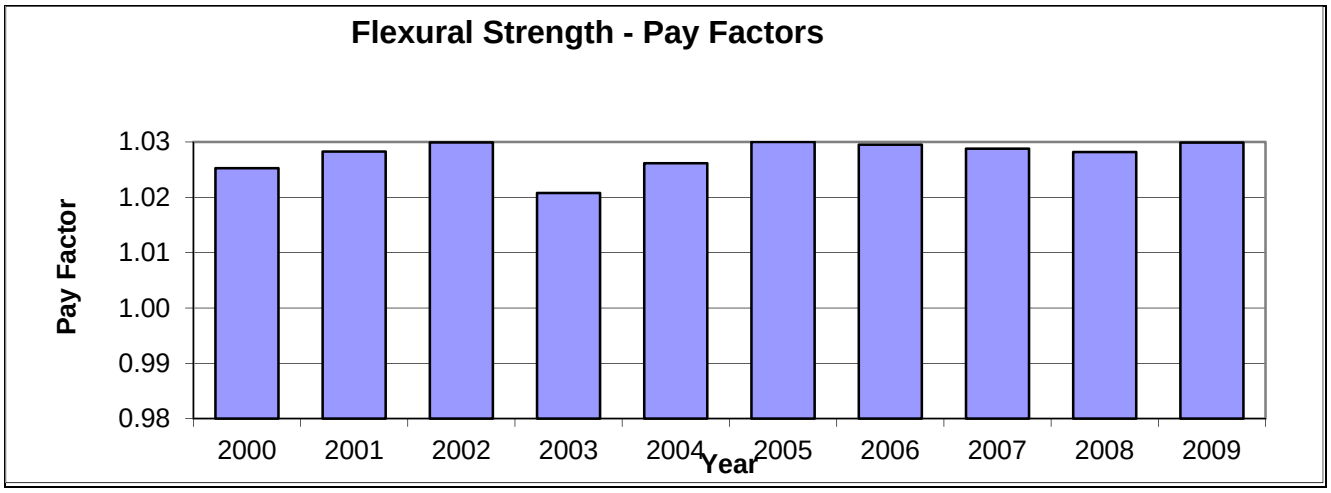


Figure 10. Flexural Strength, Pay Factors



6.5 Average Test Element Quality Levels 2000 through 2009

Table 12 displays the average quality levels by year for each of the test elements. The ten-year average quality levels for each of the elements are displayed in Figure 12. Again, the quality levels are very high, most greater than 98 percent within specification limits. The lowest reported value is 96.425 in sand equivalent. Therefore, a very high percentage of the material being produced is within specification limits.

The yearly quality levels for the elements are displayed in Figures 13 and 14. The flexural strength element had the greatest change in quality level, showing a 1.376 difference over ten years. Sand equivalency had the greatest decrease over the 10 year time frame, showing at -1.950. Thickness increased by 0.107 over the ten year span and compressive strength shows a difference of 0.409. All of the quality levels are very high, most are greater than 98 percent within specification limits.

Figure 15 plots the yearly results for each of the elements. Most of the quality levels are near or above 98 percent within specification limits. Many quality levels are approaching 100 percent within specification. In 2007 sand equivalent fell to 97 percent within specification, in 2008 sand equivalent dipped lower, to 96.4 percent quality level. In 2009 sand equivalent increased to 97.8 percent. Sand equivalent is the only quality level that has dipped below 98 percent quality level. Most of the quality levels are within a small range of values at a very high level, slightly below 98 percent to almost 100 percent within specification limits.

Table 13. Average Quality Levels by Test Element

	Thickness		Comp. Str.		Sand Equiv.		Flex. Str.	
Year	**Projects**	**QL**	**Projects**	**QL**	**Projects**	**QL**	**Projects**	**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	8	98.682	7	99.897	7	99.920	1	99.982
2003	10	98.685	7	99.859	7	99.819	3	98.452
2004	10	98.728	6	98.320	6	99.356	4	99.167
2005	5	99.647	3	99.718	3	98.262	2	100.000
2006	8	98.062	4	99.988	4	100.000	4	99.915
2007	10	99.152	7	99.536	7	97.060	3	99.798
2008	9	98.950	6	99.963	4	96.425	3	99.972
2009	5	98.877	4	99.967	2	97.801	2	99.972
"00-09"	79	98.592	54	99.597	51	99.282	29	99.612

Figure 11. Average Quality Levels by Test Element, 2000 through 2009

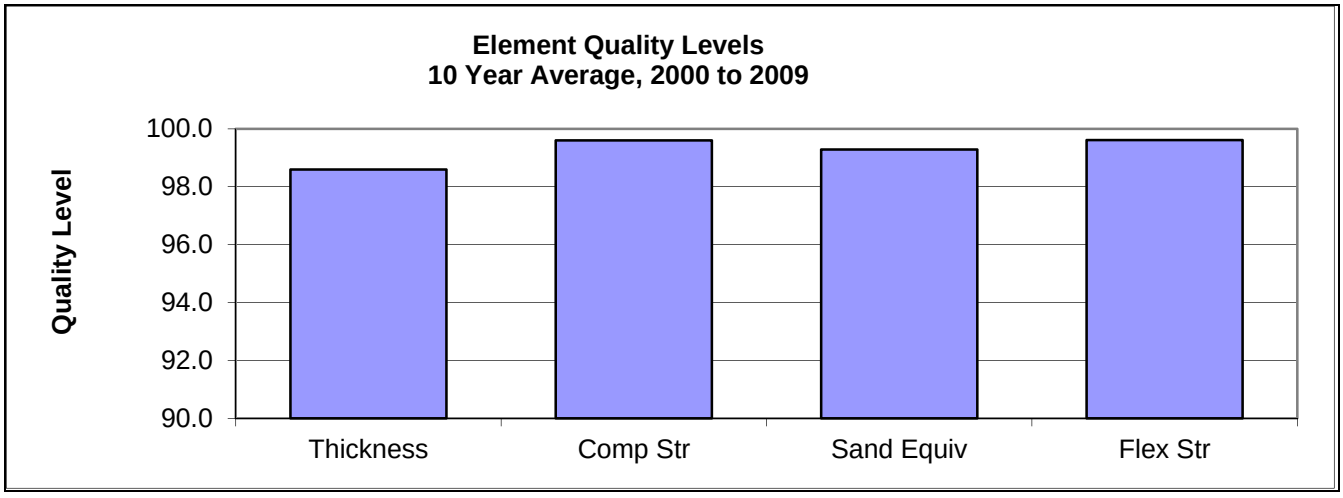


Figure 12. Thickness & Flexural Strength Quality Levels

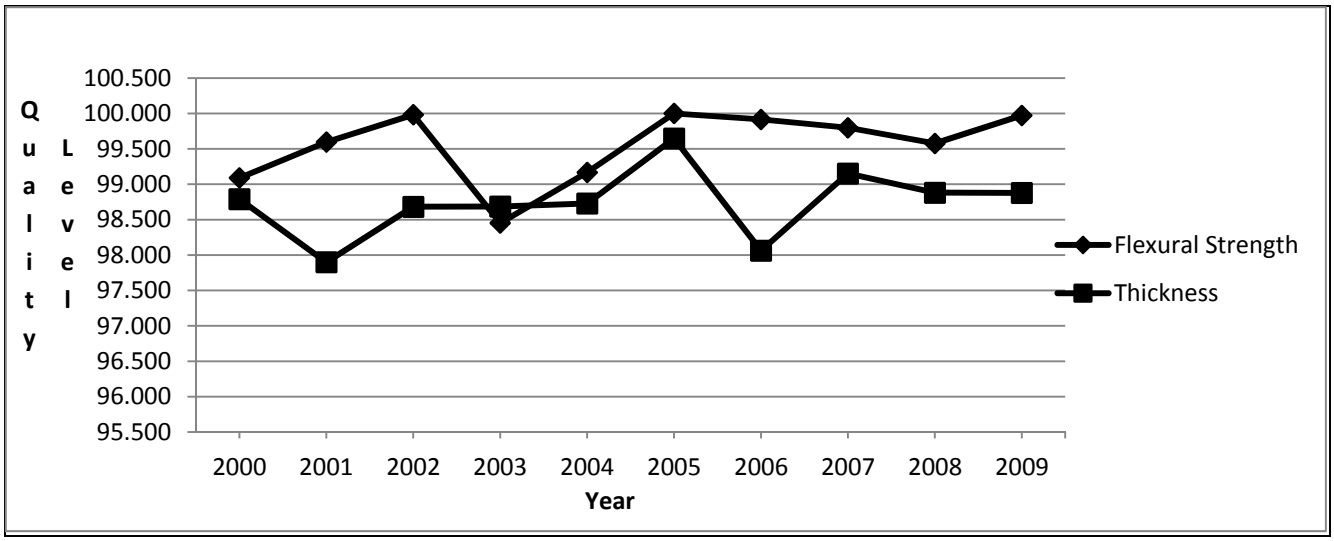
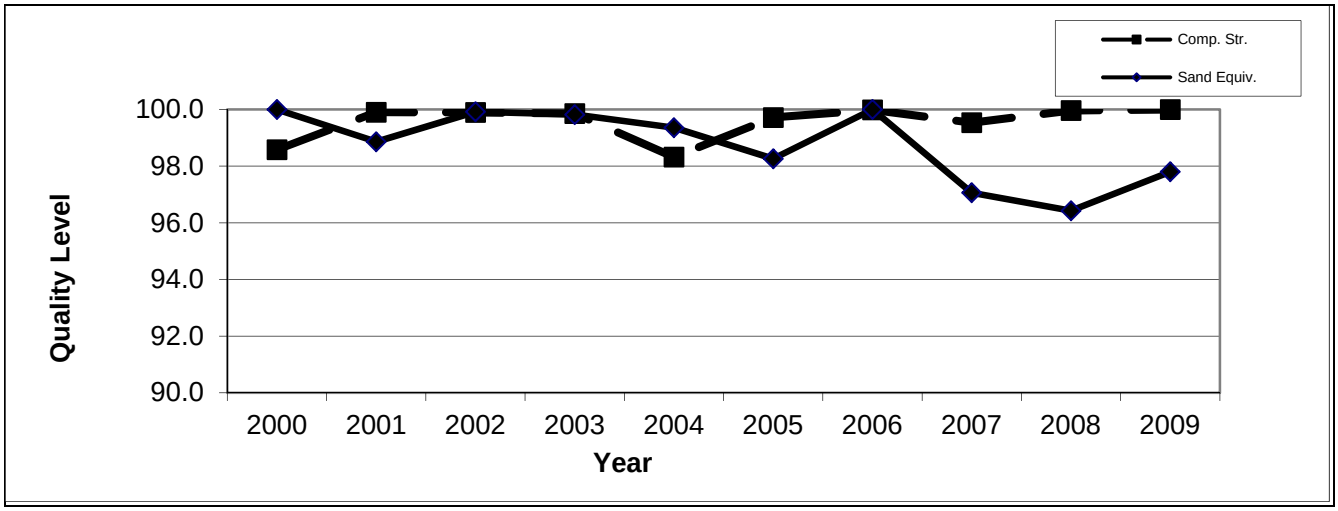


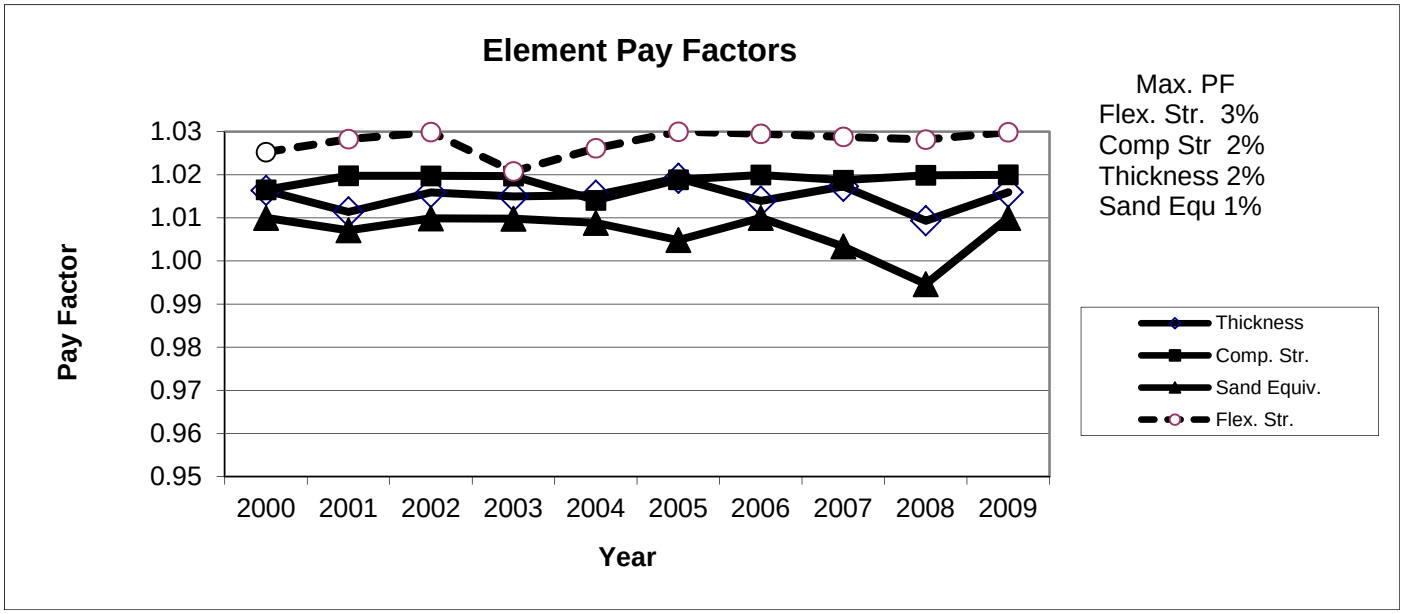
Figure 13. Compressive Strength & Sand Equivalent Quality Levels



6.6 Test Element Pay Factors 2000 through 2009

The element pay factors 2000 to 2009 are charted in Figure 15, data from Table 8. All of the elements have pay factors close to the maximum allowable limits. All of the evaluations are less than 1.0 percent lower than the maximum pay factor. The pay factors have remained at constant levels with only slight movement up or down, excluding a few outliers over the ten year range.

Figure 14. Element Pay Factors 2000 to 2009



7.0 SUMMARY

The PCCP used on the projects from 2000 through 2009 has shown that the contractors can produce high quality material. Eighty-one projects have been evaluated for this time period. Of the 81 projects, 4.9 percent received incentive between 3.0 and 3.5 percent, 27.2 percent received 3.5 to 3.9 percent incentive, 17.3 percent received 4.0 to 4.1 percent incentive, 32.1 percent received 4.2 to 4.5 percent incentive, and 18.5 percent received 4.6 to 5.0 percent. Only three projects evaluated to date failed to receive some amount of incentive payment.

The CPFC results have remained fairly consistent from 2000 to 2009. The results for each of the test elements, 2000 to 2009, show that a very high percentage of the material being produced is within specification limits, quality levels approaching 100 percent. Of the 40 data groupings, year and test element, only 4 have an average that is less than 98 percent within specification limits. All averages for flexural strength in the 10 year span have received 99 percent or higher quality level. All but two years for compressive strength have averaged 99 percent or higher. The two years that compressive strength fell below 99 percent were 2000 and 2004. In those two years compressive strength averaged above 98 percent. For most years, 2000 to 2009 thickness has averaged over 98 percent with one year, 2001 falling just below, to 97.899. Sand equivalent had maintained quality levels 98 percent or higher in years 2000 to 2006. In years 2007 through 2009, sand equivalent has hovered between 96.4 percent and 97.8 percent

The high quality levels indicate many of the element pay factors approach the maximum allowable incentive: thickness 2 percent, compressive strength 2 percent, sand equivalent 1 percent, and flexural strength 3 percent.

When reviewing the quality level results for all of the test elements, 2000 to 2009, we see that no unique distinguishing patterns can be found in any of the elements. All of the quality levels are within a small range of values at a very high

level, slightly below 98 percent to almost 100 percent in specification limits. No one test element has significantly higher or lower quality levels than any of the others. The difference between the quality levels of the individual elements is very small, less than 2 percent in every case. All of the quality levels have held at consistently high quality levels, most greater than 98.5 percent within specification limits.

Appendix B reviews project data by contractor. From 2000 to 2009, 81 projects were evaluated by number of projects, year, square yards, and incentive/disincentive. The average incentive paid per year, over the 10 year period is $1,105,827. The average square yards per year was 871,100. The average IDP for the 81 projects was $136,521. The average square yards for the 81 projects was 107,543.

Twenty-four projects were completed from 2000 to 2002. The average square yards per project was 159,059 and the average IDP was $166,354. Forty-two projects were completed in the five years from 2003 through 2007 with an average square yards of 70,331 and an average IDP of $93,584. Fifteen projects were completed from 2008 through 2009. The average square yards per project was 129,311 and the average incentive was $209,014.

The data has been presented in the most comprehensive manner. The data does not reveal any obvious trends, or significant fluctuations in the results. As data continues to be received it will be evaluated and added to future reports.

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 Veronica DeLuccie at 303 757-6528, Veronica.Deluccie@dot.state.co.us. If you find any errors in the project data please report them to Veronica DeLuccie.

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.

Portland Cement Concrete Pavement Review of QC/QA Data 2000 through 2004, (January 2006, Eric Chavez, Colorado Department of Transportation, 4201 East Arkansas Ave, Denver, CO 80222), Report No. CDOT-DTD-R-2006-5.

Portland Cement Concrete Pavement Review of QC/QA Data 2000 through 2005, (May 2007, Eric Chavez, Colorado Department of Transportation, Pavement Design Program, 4670 Holly Street, Unit A, Denver, CO 80216), Report No. CDOT-M&G-2007-01.

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 percent20Materials percent20Manual/2006/Field percent20Material percent20Manual.htm
CDOT Application Software: http://www.dot.state.co.us/ecsu/Products.asp

Appendix A

Calculated Pay Factor Composite and I/DP by Year

Criteria: Projects with Start Dates 1/1/2000 to 12/31/2009.

The CPFC is back calculated from the Project's final I/DP.

A Calculated Average Unit Price is used in the calculation.

2000 Subacct.	Bid	Start	Reg.	Test Criteria	Orig.	Quantity	Quant.	Ave.	Price	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
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
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
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
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: 8				**Total:**	1,027,275	**USA**		**Sum**	$1,109,143.52
						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

Calculated Pay Factor Composite and I/DP by Year

2001 Subacct.	Bid	Start	Reg.	Test Criteria	Orig.	Quantity	Quant.	Ave.	Price	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
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
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
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
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
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
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
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
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
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
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
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
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: 24				**Total:**	4,399,735	**USA**		**Sum**	$4,073,912.86
						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	Start	Reg.	Test Criteria	Orig.	Quantity	Quant.	Ave.	Price	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
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
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
13294	08/09/01	05/22/02	1	Comp		105,000	105,000	$20.00	$20.00	1.04766	$100,084.14
13552	05/03/01	01/01/02	2	Comp		343,524	343,524	$22.40	$22.40	1.04397	$338,330.82
13552	05/03/01	01/01/02	2	Comp		343,524	343,524	$22.40	$22.40	1.04397	$338,330.82
11925	08/30/01	08/19/02	4	Flex		563,201	563,201	$26.06	$26.06	1.04324	$634,618.54
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
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
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
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: 16					**Total:**	2,485,391	**USA**		**Sum**	$2,801,945.30
						Ave:	155,337	$26.68	**Min.**	1.02543	$43,617.66
									Max.	1.05000	$634,618.54
										Weighted Ave.	**Average**
										1.04335	$175,121.58

Calculated Pay Factor Composite and I/DP by Year

2003 Subacct.	Bid	Start	Reg.	Test Criteria	Orig.	Quantity	Quant.	Ave.	Price	CPFC	Project IDP
13574	01/30/03	08/10/03	6	Comp		72,828	72,828	$33.43	$33.43	1.05000	$121,705.38
13574	01/30/03	08/10/03	6	Comp		72,828	72,828	$33.43	$33.43	1.05000	$121,705.38
13344	07/24/03	10/25/03	6	Comp		18,284	18,284	$38.77	$38.77	1.04999	$35,436.45
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
13858	02/20/03	07/28/03	6	Comp		99,575	99,575	$14.35	$14.35	1.04929	$70,430.27
12421	05/15/03	11/16/03	4	Comp		9,106	9,106	$36.75	$36.75	1.04663	$15,604.59
12421	05/15/03	11/16/03	4	Comp		9,106	9,106	$36.75	$36.75	1.04663	$15,604.59
13480	06/27/02	06/30/03	2	Comp	SI	111,177	132,967	$42.36	$35.42	1.04529	$213,295.38
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
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
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
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
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
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: 20				**Total:**	1,269,893	**USA**		**Sum**	$1,373,064.42
						Ave:	63,495	$27.05	**Min.**	1.01008	$3,772.66
									Max.	1.05000	$213,295.38
										Weighted Ave.	**Average**
										1.03934	$68,653.22

Calculated Pay Factor Composite and I/DP by Year

2004 Subacct.	Bid	Start	Reg.	Test Criteria	Orig. Quantity	Quant.	Ave. Price		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
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
14948	08/05/04	10/04/04	3	Comp	10,580	10,580	$53.43	$53.43	1.04878	$27,575.51
14323	12/11/03	04/15/04	6	Flex	75,000	75,000	$32.70	$32.70	1.04741	$116,281.39
14323	12/11/03	04/15/04	6	Flex	75,000	75,000	$32.70	$32.70	1.04741	$116,281.39
14462	11/13/03	07/07/04	2	Comp	68,750	68,750	$21.47	$21.47	1.04699	$69,354.41
14462	11/13/03	07/07/04	2	Comp	68,750	68,750	$21.47	$21.47	1.04699	$69,354.41
14342	06/19/03	04/09/04	2	Comp	13,600	13,600	$47.88	$47.88	1.04467	$29,090.63
14342	06/19/03	04/09/04	2	Comp	13,600	13,600	$47.88	$47.88	1.04467	$29,090.63
13553	09/04/03	04/19/04	2	Flex	256,279	256,279	$20.62	$20.62	1.04068	$214,969.48
13553	09/04/03	04/19/04	2	Flex	256,279	256,279	$20.62	$20.62	1.04068	$214,969.48
14242	02/26/04	08/14/04	6	Comp	107,775	107,775	$19.06	$19.06	1.04043	$83,043.07
14242	02/26/04	08/14/04	6	Comp	107,775	107,775	$19.06	$19.06	1.04043	$83,043.07
13500	12/18/03	05/17/04	6	Flex	72,837	72,837	$32.00	$32.00	1.03482	$81,156.65
13500	12/18/03	05/17/04	6	Flex	72,837	72,837	$32.00	$32.00	1.03482	$81,156.65
13898	06/03/04	11/08/04	1	Flex	94,307	94,307	$27.88	$27.88	1.03293	$86,567.67
13898	06/03/04	11/08/04	1	Flex	94,307	94,307	$27.88	$27.88	1.03293	$86,567.67
13967	02/26/04	09/10/04	1	Comp	48,795	48,795	$30.64	$30.64	1.02905	$43,436.69
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: 20				**Total:**	1,558,040	**USA**		**Sum**	$1,640,848.20
					Ave:	77,902	$26.11	**Min.**	1.02905	$27,575.51
								Max.	1.04927	$214,969.48
									Weighted Ave.	**Average**
									1.04016	$82,042.41

Calculated Pay Factor Composite and I/DP by Year

2005 Subacct.	Bid	Start	Reg.	Test Criteria	Orig. Quantity	Quant.	Ave.	Price	CPFC	Project IDP
12369	10/02/03	07/14/05	6	Flex	90,647	90,647	$22.00	$22.00	1.04940	$98,520.52
12369	10/02/03	07/14/05	6	Flex	90,647	90,647	$22.00	$22.00	1.04940	$98,520.52
14234	04/14/05	06/12/05	6	Comp	83,742	83,742	$34.15	$34.15	1.04874	$139,392.14
14234	04/14/05	06/12/05	6	Comp	83,742	83,742	$34.15	$34.15	1.04874	$139,392.14
13568	07/01/04	06/14/05	4	Flex	91,669	91,669	$28.95	$28.95	1.04815	$127,794.08
13568	07/01/04	06/14/05	4	Flex	91,669	91,669	$28.95	$28.95	1.04815	$127,794.08
14979	03/31/05	07/06/05	3	Comp	7,103	7,103	$63.44	$63.44	1.03695	$16,649.20
14979	03/31/05	07/06/05	3	Comp	7,103	7,103	$63.44	$63.44	1.03695	$16,649.20
14482	07/29/04	07/08/05	6	Comp	3,202	3,202	$55.00	$55.00	0.89336	($18,780.42)
14482	07/29/04	07/08/05	6	Comp	3,202	3,202	$55.00	$55.00	0.89336	($18,780.42)
		Number of Projects: 10			**Total:**	552,726	**USA**		**Sum**	$727,151.04
					Ave:	55,273	$29.44	**Min.**	0.89336	($18,780.42)
								Max.	1.04940	$139,392.14
									Weighted Ave.	**Average**
									1.04666	$72,715.10

Calculated Pay Factor Composite and I/DP by Year

2006 Subacct.	Bid	Start	Reg.	Test Criteria	Orig.	Quantity	Quant.	Ave.	Price	CPFC	Project IDP
14838	06/09/05	05/08/06	4	Flex		138,418	138,418	$33.83	$33.83	1.05000	$234,147.14
14838	06/09/05	05/08/06	4	Flex		138,418	138,418	$33.83	$33.83	1.05000	$234,147.14
15662	07/27/06	11/14/06	6	Comp		4,703	4,703	$44.00	$44.00	1.04999	$10,344.54
15662	07/27/06	11/14/06	6	Comp		4,703	4,703	$44.00	$44.00	1.04999	$10,344.54
13003	04/21/05	05/03/06	2	Comp	SI	59,796	71,515	$49.20	$41.14	1.04449	$130,883.29
13003	04/21/05	05/03/06	2	Comp	SI	59,796	71,515	$49.20	$41.14	1.04449	$130,883.29
14416	03/23/06	08/18/06	6	Comp		11,760	11,760	$45.75	$45.75	1.04249	$22,861.14
14416	03/23/06	08/18/06	6	Comp		11,760	11,760	$45.75	$45.75	1.04249	$22,861.14
13697	08/04/05	01/18/06	6	Flex		46,585	46,585	$30.79	$30.79	1.04123	$59,144.82
13697	08/04/05	01/18/06	6	Flex		46,585	46,585	$30.79	$30.79	1.04123	$59,144.82
14829	07/13/06	09/01/06	4	Comp		8,882	8,882	$70.00	$70.00	1.04102	$25,501.97
14829	07/13/06	09/01/06	4	Comp		8,882	8,882	$70.00	$70.00	1.04102	$25,501.97
12490	05/05/05	06/13/06	1	Flex		107,153	107,153	$27.00	$27.00	1.03772	$109,140.45
12490	05/05/05	06/13/06	1	Flex		107,153	107,153	$27.00	$27.00	1.03772	$109,140.45
15139	08/25/05	05/01/06	1	Flex		45,826	45,826	$33.64	$33.64	1.02858	$44,056.54
15139	08/25/05	05/01/06	1	Flex		45,826	45,826	$33.64	$33.64	1.02858	$44,056.54
	Number of Projects: 16					**Total:**	869,685	**USA**		**Sum**	$1,272,159.78
						Ave:	54,355	$34.17	**Min.**	1.02858	$10,344.54
									Max.	1.05000	$234,147.14
										Weighted Ave.	**Average**
										1.04248	$79,509.99

Calculated Pay Factor Composite and I/DP by Year

2007 Subacct.	Bid	Start	Reg.	Test Criteria	Orig. Quantity	Quant.	Ave. Price		CPFC	Project IDP
15699	11/09/06	08/03/07	6	Comp	12,070	12,070	$48.59	$48.59	1.04999	$29,320.14
15699	11/09/06	08/03/07	6	Comp	12,070	12,070	$48.59	$48.59	1.04999	$29,320.14
14598	07/13/06	04/20/07	1	Flex	187,784	187,784	$36.47	$36.47	1.04995	$342,092.29
14598	07/13/06	04/20/07	1	Flex	187,784	187,784	$36.47	$36.47	1.04995	$342,092.29
12491	04/26/07	09/11/07	1	Comp	29,264	29,264	$48.00	$48.00	1.04755	$66,787.63
12491	04/26/07	09/11/07	1	Comp	29,264	29,264	$48.00	$48.00	1.04755	$66,787.63
13289	05/18/06	05/21/07	2	Flex	285,487	285,487	$35.49	$35.49	1.04564	$462,433.38
13289	05/18/06	05/21/07	2	Flex	285,487	285,487	$35.49	$35.49	1.04564	$462,433.38
14986	06/15/06	05/08/07	4	Flex	203,852	203,852	$35.81	$35.81	1.04416	$301,301.58
14986	06/15/06	05/08/07	4	Flex	203,852	203,852	$35.81	$35.81	1.04416	$301,301.58
15927	01/11/07	05/16/07	3	Comp	28,018	28,018	$77.75	$77.75	1.04319	$94,083.22
15927	01/11/07	05/16/07	3	Comp	28,018	28,018	$77.75	$77.75	1.04319	$94,083.22
15490	04/19/07	08/22/07	1	Comp	21,171	21,171	$48.00	$48.00	1.02967	$30,146.12
15490	04/19/07	08/22/07	1	Comp	21,171	21,171	$48.00	$48.00	1.02967	$30,146.12
15179	11/02/06	08/01/07	6	Comp	42,966	42,966	$55.81	$55.81	1.02674	$64,921.19
15179	11/02/06	08/01/07	6	Comp	42,966	42,966	$55.81	$55.81	1.02674	$64,921.19
14557	02/22/07	06/18/07	5	Comp	33,529	33,529	$53.02	$53.02	1.01711	$30,408.41
14557	02/22/07	06/18/07	5	Comp	33,529	33,529	$53.02	$53.02	1.01711	$30,408.41
14368	08/31/06	04/30/07	4	Comp	7,157	7,157	$54.00	$54.00	0.98449	($5,992.97)
14368	08/31/06	04/30/07	4	Comp	7,157	7,157	$54.00	$54.00	0.98449	($5,992.97)
		Number of Projects: 20			**Total:**	1,702,596	**USA**		**Sum**	$2,831,001.98
					Ave:	85,130	$39.97	**Min.**	0.98449	($5,992.97)
								Max.	1.04999	$462,433.38
									Weighted Ave.	**Average**
									1.04329	$141,550.10

Calculated Pay Factor Composite and I/DP by Year

2008 Subacct.	Bid	Start	Reg.	Test Criteria	Orig. Quantity	Quant.	Ave. Price		CPFC	Project IDP
16026	08/16/07	04/21/08	1	Flex	175,556	175,556	$32.10	$32.10	1.05000	$281,756.72
16026	08/16/07	04/21/08	1	Flex	175,556	175,556	$32.10	$32.10	1.05000	$281,756.72
15504	06/05/08	10/12/08	5	flex	148,982	148,982	$36.31	$36.31	1.05000	$170,636.44
15504	06/05/08	10/12/08	5	flex	148,982	148,982	$36.31	$36.31	1.05000	$170,636.44
15145	04/17/08	07/30/08	4	Comp	8,824	8,824	$75.00	$75.00	1.04986	$32,996.98
15145	04/17/08	07/30/08	4	Comp	8,824	8,824	$75.00	$75.00	1.04986	$32,996.98
13192	05/24/07	03/03/08	4	FLEX	318,410	318,410	$37.63	$37.63	1.04942	$592,210.30
13192	05/24/07	03/03/08	4	FLEX	318,410	318,410	$37.63	$37.63	1.04942	$592,210.30
16046	04/17/08	09/10/08	1	flex	139,342	139,342	$42.61	$42.61	1.04761	$282,693.31
16046	04/17/08	09/10/08	1	flex	139,342	139,342	$42.61	$42.61	1.04761	$282,693.31
15555	04/10/08	09/22/08	1	Comp	173,381	173,381	$41.52	$41.52	1.04662	$344,318.64
15555	04/10/08	09/22/08	1	Comp	173,381	173,381	$41.52	$41.52	1.04662	$344,318.64
16263	07/10/08	10/25/08	6	Comp	3,989	3,989	$47.85	$47.85	1.03999	$7,633.04
16263	07/10/08	10/25/08	6	Comp	3,989	3,989	$47.85	$47.85	1.03999	$7,633.04
15913	06/14/07	07/30/08	4	Comp	151,102	151,102	$31.52	$31.52	1.03754	$178,728.53
15913	06/14/07	07/30/08	4	Comp	151,102	151,102	$31.52	$31.52	1.03754	$178,728.53
15914	06/14/07	07/30/08	4	Comp	5,451	5,451	$72.28	$72.28	1.02979	$11,736.49
15914	06/14/07	07/30/08	4	Comp	5,451	5,451	$72.28	$72.28	1.02979	$11,736.49
15568	04/17/08	08/29/08	2	Comp	3,662	3,662	$57.00	$57.00	0.97190	($5,866.01)
15568	04/17/08	08/29/08	2	Comp	3,662	3,662	$57.00	$57.00	0.97190	($5,866.01)

Number of Projects: 20

Total:	2,257,398	**USA**		**Sum**	$3,793,688.88
Ave:	112,870	$37.55	**Min.**	0.97190	($5,866.01)
			Max.	1.05000	$592,210.30
				Weighted Ave.	**Average**
				1.04697	$189,684.44

Calculated Pay Factor Composite and I/DP by Year

2009 Subacct.	Bid	Start	Reg.	Test Criteria	Orig. Quantity	Quant.	Ave. Price		CPFC	Project IDP
17249	04/23/09	08/19/09	6	Comp	29,110	29,110	$41.17	$41.17	1.04842	$58,031.58
17249	04/23/09	08/19/09	6	Comp	29,110	29,110	$41.17	$41.17	1.04842	$58,031.58
17245	06/18/09	11/25/09	4	comp	7,804	7,804	$43.00	$43.00	1.04828	$16,201.40
17245	06/18/09	11/25/09	4	comp	7,804	7,804	$43.00	$43.00	1.04828	$16,201.40
16819	04/30/09	10/14/09	1	flex	211,558	211,558	$27.36	$27.36	1.04800	$277,838.39
16819	04/30/09	10/14/09	1	flex	211,558	211,558	$27.36	$27.36	1.04800	$277,838.39
16214	02/26/09	06/19/09	4	Comp	223,178	223,178	$19.18	$19.18	1.01441	$61,675.36
16214	02/26/09	06/19/09	4	Comp	223,178	223,178	$19.18	$19.18	1.01441	$61,675.36
16025	10/09/08	10/29/09	1	Comp	22,176	22,176	$52.70	$52.70		
16025	10/09/08	10/29/09	1	Comp	22,176	22,176	$52.70	$52.70		
	Number of Projects: 10				**Total:**	987,652	**USA**		**Sum**	$827,493.46
					Ave:	98,765	$25.86	**Min.**	1.01441	$16,201.40
								Max.	1.04842	$277,838.39
									Weighted Ave.	**Average**
									0.98579	$82,749.35

Totals: *1/1/2000 to 12/31/2009.*

		Quant.	Ave.		CPFC	IDP
Number of Projects: 164	**Total:**	17,110,391			**Sum**	$20,450,409.44
	Ave:	104,332	$29.41	**Min.**	0.89336	($18,780.42)
				Max.	1.05000	$634,618.54
			Weighted Ave.		1.03852	$124,697.62

Appendix B
PCCP projects by contractor, years 2000 to 2009

Co.	# of Proj.	Year	Quant	IDP	AVG CPFC	Test Crit.
Advantage Ready Mix	1	2000	93,509	$109,774.89	1.02665	C
	3	2001	273,223	$247,765.53	1.02757	C
	1	2002	36,044	$77,016.21	1.03794	C
	1	2003	9,409	$3,772.66	1.01008	C
Total	**6**		**412,185**	**$438,329.29**		
Aggregate Industries						
	1	2001	8,856	$15,464.53	1.04276	C
	1	2003	70,961	$121,705.38	1.05	C
Total	**2**		**79,817**	**$137,169.91**		
Asphalt Specialities, Co.	1	2001	130,901	$73,873.03	1.03115	C
	2	2002	173,354	$201,430.83	1.04883	C
	1	2003	18,903	$27,708.11	1.0439	C
	3	2004	259,963	$284,005.71	1.03839	F
	1	2005	92,419	$98,520.52	1.0494	F
	1	2009	27,962	$743,569.78	1.04285	F
Total	**9**		**703,502**	**$1,429,107.98**		
Bestway	1	2007	7,342	-$5,992.97	0.98449	C
	1	2008	3,325	$7,633.04	1.03999	C
	1	2009	8,419	$16,201.40	1.04828	C
Total	**3**		**19,086**	**$17,841.47**		
Kiewit Western	1	2006	63,685	$130,883.29	1.04449	
Total	**1**		**63,685**	**$130,883.29**		C
LaFarge	2	2004	45,482	$96,524.11	1.04902	C
	1	2005	5,549	$16,649.20	1.03695	C
	1	2007	28,482	$94,083.22	1.04319	C
Total	**4**		**79,513**	**$207,256.53**		
Lawson Constr.	2	2001	449,523	$475,335.02	1.04512	F
	1	2002	556,156	$634,618.54	1.04324	F
	1	2006	46,060	$59,144.82	1.04123	F
	1	2007	202,380	$301,301.58	1.04416	F
	1	2008	130,080	$170,636.44	1.05	F
	1	2009	292,475	$61,675.36	1.01441	C
Total	**7**		**1,676,674**	**$1,702,711.76**		

Leone Sand & Gr	1	2004	4,457	$29,090.63	1.04467	C
Total	**1**		**4,457**	**$29,090.63**		

New Design	1	2002	35,985	$58,924.49	1.0497	C
	1	2005	5,558	(18780.42	0.89336	C
Total	**2**		**41,543**	**$58,924.49**		

Ready Mixed	1	2006	10,541	$22,861.14	1.04249	C
	3	2007	80,959	$124,387.45	1.03547	C
Total	**4**		**91,500**	**$147,248.59**		

Ritchey's Redi-Mix	1	2006	8,979	$25,501.97	1.04102	C
	1	2008	8,640	$32,996.98	1.04986	C
Total	**2**		**17,619**	**$58,498.95**		

Rocky Mountain Pre	1	2009	114,455	$139,088.30	1.03451	C
Total	**1**		**114,455**	**$139,088.30**		

Castle Rock Const.	2	2000	257,418	$167,889.61	1.03595	C/F
	2	2001	513,326	$461,748.68	1.02589	C/F
	1	2002	344,122	$338,330.82	1.04397	C/F
	5	2003	394,264	$304,446.09	1.0366	3F/2C
	2	2004	293,180	$258,406.17	1.03487	1F/1C
	1	2005	94,463	$127,794.08	1.04815	F
	2	2006	153,026	$153,196.99	1.03315	F
	2	2007	63,167	$97,196.04	1.03233	C
	1	2008	140,185	$282,693.31	1.04761	F
	1	2009	213,856	$277,838.39	1.048	F
Total	**19**		**2,467,007**	**$2,469,540.18**		

Fremont Paving	1	2008	3,201	-$5,866.01	0.9719	C
Total	**1**		**3,201**	**-$5,866.01**		

IHC	1	2000	204,138	$276,907.26	1.04915	C
	3	2001	674,869	$762,769.64	1.04426	2F/1C
	1	2003	111,318	$213,295.38	1.04529	C
	2	2004	177,400	$152,397.48	1.04371	C
	1	2005	82,890	$139,392.14	1.04874	C
	1	2006	137,790	$234,147.14	1.05	F
	2	2007	476,180	$804,525.67	1.04779	F
	2	2008	514,252	$936,528.94	1.04654	1F/1C
Total	**13**		**2,378,837**	**$3,519,963.65**		

Sema Constr.	1	2002	39,288	$47,034.10	1.02543	C
Total	**1**		**39,288**	**$47,034.10**		
SRMC Sterling Ready	1	2003	9,104	$15,604.59	1.04663	C
Total	**1**		**9,104**	**$15,604.59**		
Trans Colo. Conc.	1	2002	26,705	$43,617.66	1.03969	C
Total	**1**		**26,705**	**$43,617.66**		
Upper Plains Cont.	3	2008	482,818	$472,221.74	1.03911	1F/2C
Total	**3**		**482,818**	**$472,221.74**		
Grand Total	**81**		**8,710,996**	**11,058,267**		