The Effect of Contracting Out on Engineering Costs

"FHWA data indicates that contracting out 50% to 70% of engineering work results in the lowest cost for engineering"

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PREFACE

This study of FHWA data indicates a strong correlation between the cost of engineering and the volume of work contracted out to private sector firms. The optimum level for contracting out appears to be from 50% to 70% of all engineering work.

Unlike other studies that have tried to focus on partial costs of engineering, this study focuses on total engineering program costs. This total cost approach provides a better perspective than studies focusing on portions of cost.

The FHWA data was sorted for several significant variables, including geography, mileage, traffic density and the size of construction budgets. Only the contracting out percentage resulted in a correlation with engineering costs.

This report supplements the study of all fifty states with specific comparisons of California spending for transportation engineering.

The findings clearly indicate contracting out a significant portion of engineering work results in a lower total program cost for engineering.

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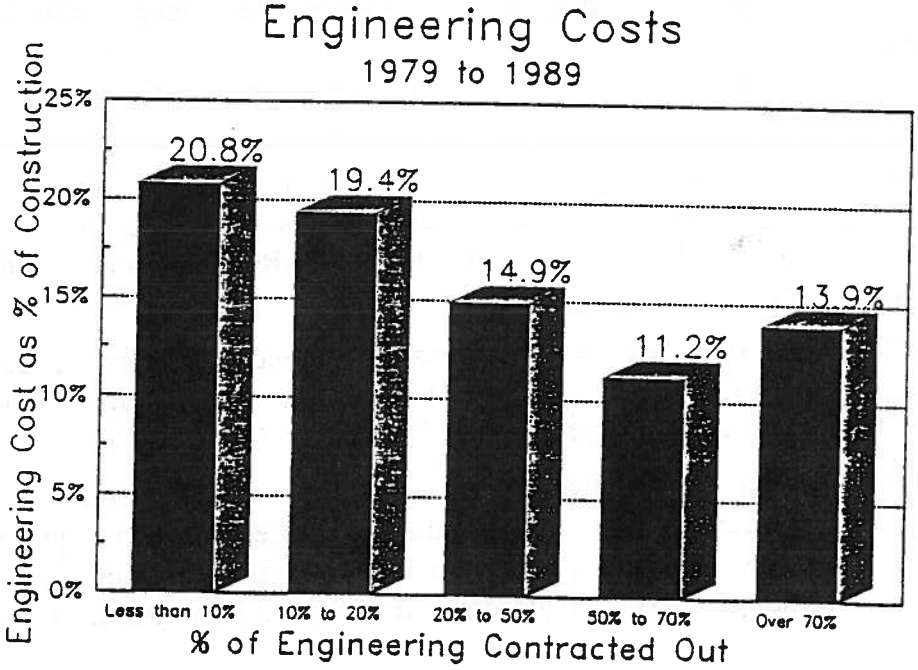
Executive Summary

This study of design and construction engineering costs uses data reported by state and local governments to the Federal Highway Administration (FHwA) that is published annually by the U S Department of Transportation. The study encompasses eleven years of data, from 1979 to 1989

The purpose of the study is to assess the expenditure of Preliminary and Construction Engineering (PCE) costs in terms of both trends and in relation to specific factors, including the size of construction budgets, the impact of contracting out to private sector design firms, costs based on mileage factors and costs based on other geographic considerations including mountain and sea coast terrain.

One variable factor clearly has a bearing on the relative of cost of engineering-the use of contracting out for engineering. **States contracting out between 50% and 70% of their engineering work have achieved the lowest total cost of engineering as a percentage of construction over the eleven year period.**

Figure 1



States that contract out between 50% and 70% of their engineering work have achieved the lowest PCE cost as a percentage of construction over the past 11 years.

No other factors, such as the size of the construction program, state highway mileage, traffic density or geographic considerations appear to have a consistent impact on engineering cost levels relative to construction spending.

This study clearly points to maximum cost effective utilization of taxpayer dollars through contracting out 50% to 70% of all engineering work.

The study results also indicate contracting out is more cost effective when construction funding levels are either increased or decreased. FHWA data indicates all states have either reduced construction spending or increased construction spending (above the level attributable to inflation) at least once during the period studied. **When construction funding levels change, states contracting out more than 50% of their engineering work are better able to control engineering costs as a % of construction.**

The study also reveals engineering costs for transportation have risen over the period, a not unexpected finding. Increased environmental concern, safety considerations and neighborhood activism have contributed more demands for additional engineering efforts. Apparently, contracting out engineering services contributes to controlling these increased costs. **Only those states that have increased their contracting out (as a % of total engineering work) have been able to keep engineering costs level as a percentage of construction. The states contracting out less than 10% of their engineering work have seen the largest increases in engineering costs relative to construction.**

Whether these factors have been officially recognized or not by state transportation agencies, the trend over the period has been to increase contracting out. **Overall contracting out has increased over the period, and a majority of states feel contracting out is cost effective.**

In preparing this report, other reports and studies of contracting out were reviewed. In general, these reports tried to focus on comparative costs for individual engineering projects, and/or comparisons of partial cost data.

Making cost comparisons of alternatives in engineering on a detailed project by project basis may well be impossible due to the unique nature of individual projects and inconsistency between government and private sector cost accounting. Partial cost comparisons, while helpful do not address overall cost effectiveness on a total program basis.

Only a total program comparison, such as this analysis, provides a comprehensive view of engineering cost effectiveness.

One other interesting finding is contracting out engineering is apparently more cost effective currently than it was ten years ago. While we can not determine an objec-

tive reason for this, one possible explanation is private sector engineering firms have better adjusted to overall changes in engineering requirements and the technology changes that have occurred.

Based on the findings of this study, it is clear contracting out engineering requirements helps transportation departments achieve maximum cost effectiveness. It is also very clear that not utilizing contracting out, or contracting out only a minimum of total engineering work is the least cost effective use of taxpayer dollars. It appears that the cost advantages of contracting out are increasing, indicating transportation agencies should be moving to increase their use of private sector firms for engineering in order to maximize the results achieved from the taxpayers dollars.

Perhaps Engineering News Record says it best in a recent editorial commenting on a change by the Tennessee Valley Authority (TVA) to contracting out:[1]

> *"The TVA message is an instructive one for those highway departments and other public agencies that continue to insist on doing design and construction work in-house. With many state and local governments in fiscal trouble, this is a luxury they can ill afford"*

1 Engineering News Record, May 20, 1991, page 66

Key Study Findings

The analysis of FHwA data provides a great deal of insight into the relative spending policies of states and local governments. The comparative analyses performed show clearly the impact of contracting out in maintaining a cost effective engineering program.

Key study findings include:

Contracting out of PCE work is more cost effective:

- The states having the lowest PCE cost as a percent of construction contract out between 50% and 70% of their PCE work.
- States with less than 10% contracting out consistently have the most expensive PCE
- From 1979 to 1989, states contracting out 50% to 70% of their engineering work saw total engineering costs only 54% as high as states contracting out 10% or less of their work.
- States contracting out 50% to 70% of their engineering work saw engineering cost increases of 15.4% while engineering costs rose 21.5% for states contracting out 10% or less.
- States increasing their contracting out percentage by more than 10% have seen declines in their PCE costs as a percentage of construction cost

Construction funding is subject to change in all states. This change creates variable needs for engineering efforts.

- All fifty states have seen construction costs decline in at least one year from 1979 to 1989. Twenty-six states have seen declines of 20% or more on a year to year basis.
- All fifty states have seen construction increases of more than 10% on a year to year basis, and 47 have seen year to year gains of 20% or more.
- States contracting out 50% or more of their engineering work were able to hold engineering cost increases even with the rate of growth in construction, while states contracting out less than 50% saw engineering costs increase at twice the rate of construction increases.
- When construction funding declines, states contracting out less than 10% of their work saw engineering costs rise 123% (as % of construction) while states contracting out more than 50% saw increases of only 23%.

The use of contracting out is increasing:

- The overall percentage of contracting out has risen from 30% to the 50% level since 1979.

- Seventeen states have changed their policies to increase contracting out, but no state has changed policies to reduce the use of contracting out.
- An additional 14 states are planning to increase contracting out over the next few years while 34 will contract out at the same level.
- The dollar volume of contracting out has doubled to $1.4 billion since 1979.

A majority of states believe contracting out of engineering work is cost effective.

- A majority of states feel contracting out is cost effective when compared with in-house design costs when all cost factors are considered
- Almost all states use consultants for all major phases of transportation engineering tasks.
- Agencies and owners other than transportation also have found that contracting out more than 50% of their work is cost effective

Contracting out of engineering tasks enables a transportation agency to meet its needs without incurring the costs of full time staff.

- Contracting out allows states to utilize specialized design skills on an as-needed basis rather than having the responsibility for full time staff costs
- Contracting out is used for increases in construction spending where the ability to begin design quickly is important to overall cost savings
- Consultant use allows more flexibility and cost control when construction spending levels decline

By including eleven years of data and all fifty states, this study provides a broad overview of contracting out policies and engineering spending. The results are very clear--contracting out is clearly a factor in achieving cost effective engineering.

Evaluating Engineering Costs

Historically, engineering costs have been measured as a total cost relative to construction costs. Engineering costs have typically been expressed as a percentage of construction costs.

Prior to the mid 70's, percentage of construction cost was the predominate method for determining engineering fees in both government and private sector contracting.

The federal government replaced percentage of construction cost contracting with the current cost based system after selection of a design firm based on qualifications (QBS). The Department of Justice also forced the major professional societies to abandon their published percentage of construction cost fee guidelines on the theory these constituted a form of price fixing.

Despite the decline in the use of percentage of cost as a form of contracting, its use is still recognized in both federal law and agency regulations.

All federal engineering/architectural contracting is done by the provisions of the Brooks Act (P.L. 92-582). Among the provisions of this act, certain design functions are limited to a 6% of construction cost maximum. FHwA regulations also recognize a percentage of construction cost as a threshold for the reasonableness of engineering costs for federal aid reimbursement purposes.[2]

Thus, the use of percent of construction cost still retains its usefulness as a guide for measuring engineering cost performance, even though its use as a sole basis for contracting has declined.

Percent of construction cost is the best measurement of cost effectiveness presently available. Defining percent of construction cost, it is the total engineering cost to accomplish a dollar value of construction. It is also best used over time, and over a number of projects where individual project differences do not unfairly impact the comparisons.

Problems in Comparing Engineering Costs

Several other approaches have been used to try to evaluate the costs of engineering. Each of these approaches has limitations.

Some comparisons have focused on the hourly rates for engineering staff. This approach does not take into account several factors, including the time it takes to perform a task (cost equals rate times hours), the level of staff used to perform a particular task (a higher skill/paid individual may be assigned to the same task on

2 This regulation sets a maximum of 15% of construction cost as eligible for construction engineering reimbursement. 23 CFR Part 140 Section 140.201

different projects) and the overall mix of staff is not considered (overall average pay rates may be higher in an organization where comparable individual rates are lower).

Comparisons of hourly pay rates for individuals simply can not be used for overall cost comparisons. This method ignores all but one factor in cost determination.

Other comparisons of engineering costs have attempted to focus on overhead rates as a measure of cost effectiveness. Overhead costs as a basis of cost effectiveness are an even more limited basis for comparing costs. In a study of U. S. Army Corps of Engineers engineering costs, the unreliability of using overhead rates was described as follows:[3]

> *"Two cost comparisons are possible: the total cost of providing a service, and the indirect cost rates. The total cost comparison is the more meaningful since it reflects the complete cost of providing a service. The comparison of indirect costs is less meaningful since those costs are normally expressed as percentages of direct labor. Consequently, accounting practices and policies - within USACE or in private sector firms - can result in an item being a direct cost in one organization an indirect cost in another. Engineering and construction organizations can charge the same price to produce a product but have very different cost rates. For that reason, we base most of our analysis on total costs."*

Overhead, or indirect cost rates only reflect the relationship of costs within a single organization based on how costs are elected to be accounted for. Even a comparison of indirect cost rates between two groups is not realistic unless a very detailed study of comparable costing policies is performed and adjustments to accounting records are made to reflect differences in costing policies.

This problem is often a major difficulty in comparing private sector engineering costs to costs within a government agency. Unless a very comprehensive study is conducted, the difference in how accounting records and allocates costs will not produce meaningful results. Several other studies have acknowledged the difficulty of completely and fairly allocating overhead costs to in-house engineering efforts.

Thus detail, project by project cost comparisons can not be objectively prepared. Only an overall comparison of expenditure levels, over time provides a fair evaluation of cost effectiveness.

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3 Monitoring and Controlling Engineering and Construction Management Cost, Performance within the Corps of Engineers, Report AR801R1, December 1988

Since engineering design costs typically represent about 10% of construction costs, and inflation has been 5% to 6% over the past few years, schedule can have a material impact on engineering cost effectiveness. A delay of six months can raise construction costs by 2 1/2%. This cost of delay could represent 25% of engineering costs. Thus the ability to either quickly begin design, or add immediate staffing capability to complete design sooner can have a dramatic impact on the total costs that can be associated with engineering.

Similarly, the use of in-house staff means the agency is assuming some future cost risks that can not be objectively determined. Included in these unquantifiable risks would be the need for the staff in the future, the benefit costs associated with future employment as well as the liability risks associated with design. Since these costs can not be objectively determined, comparison of in-house to contracting out costs can not be objectively compared on a single project basis.

Engineering design is by nature extremely variable in skills required, and construction programs generally require many different skills from time to time. In short, the skills required today may not be the skills required tomorrow. In-house staffs frequently face a mismatch of skills available and skills needed where contracting out allows the use of only those skills needed. States that choose to use in-house staff for a majority of their work thus assume the risk that their future skill requirements will match the skills available.

Proper cost determination would also require that the current value of future benefits such as retirement plans be allocated to the current period as employees earn the benefits. Future legislative actions may modify these benefits, so current cost accruals are dependant on unknown future actions.

Construction has also become a fertile field for litigation, thus also creating potential future risks if in-house staff is used to prepare the engineering design.

The use of in-house staff is the assumption of these risks by the agency, while contracting out transfers many of these risks to the outside contractor. Reasonable people will agree that there is a cost associated with the assumption of these risks, but since only future events will objectively determine the cost, it is impossible to be totally objective in any cost comparison on a current basis.

To summarize, several factors contribute to the difficulty in objectively determining comparative engineering costs.

- ✓ Comparing the use of in-house staff to outside consultants involves a degree of risk for in-house staff that is not present for consultants. While reasonable people will recognize there is a cost for this risk, since it is dependant on unknown future events, it is impossible to quantify.

- ✓ No two construction projects are ever exactly alike, plus there are multiple engineering solutions to almost every project, plus multiple alternatives in staffing and scheduling. Thus simply comparing estimated costs from two sources is unlikely to produce a fair or complete comparison.
- ✓ The differences in accounting records and cost accumulations between different firms, or agencies will minimize the ability to draw conclusions as to total cost differences.
- ✓ The effect of inflation on construction costs from different completion schedules for engineering work can easily be close to the full current cost of engineering from comparison of labor and/or overhead rates.

Thus a comparison of individual project engineering costs is unlikely to produce meaningful objective results as to the relative cost of alternative engineering choices. There are simply too many variables, some of which depend on future events, to precisely quantify the relative cost effectiveness of engineering on a project by project basis.

A Total Cost Approach

To determine cost effectiveness, the total cost of an engineering program should be looked at. Only by looking at the total cost for all projects, and drawing general conclusions from the overall assessment can it be determined that cost effectiveness has been obtained.

This study of FHwA compiled data is a unique opportunity to assess the cost effectiveness of engineering as there is both a significant number of agencies and a similarity of design effort present, as well as data prepared on a common basis for over a decade.

All fifty states have roadway design requirements, and due to federal supported standards, the design efforts are for largely similar end products. Since this data covers over a decade of experience, the comparison is not affected by unusual occurrences in a particular year, or for particular projects.

FHwA cost data includes Preliminary & Construction Engineering (PCE) which includes total engineering costs for both preliminary design and construction inspection, as well as related costs of testing and surveying. This broad definition of engineering is well suited to a total cost study as it encompasses the full range of engineering activities required to accomplish highway construction.

To further minimize the impact of particular projects, or changes in state policies (such as a temporary cutback on construction due to budget constraints), the FHwA data was looked at over a minimum three year period. By utilizing a multi-year basis, the impact of unusual occurrences on the data is minimized.

The FHwA data was confirmed and supplemented by a survey of all 50 state DOTS. A summary of this survey appears in this report. The primary FHwA data used in this study also is produced in this report, as are the definitions of costs used by FHwA.

Study Methodology

The FHwA data was sorted to test for several variables in order to determine if any individual variable could be equated with PCE costs. These variables included:

I. Volume of construction (Does the size of the construction program affect the level of PCE costs?)

II. Traffic Density (Does high traffic volume per mile of highway affect the level of PCE costs?)

III. State/Local Responsibility (Does the portion of roads under state vs. local control effect the level of PCE costs?)

IV. Construction Spending Per Mile (Does the intensity/complexity of construction effect the level of PCE costs?)

V. Geography (Do significant geographic factors, such as coastal regions or mountainous areas effect the level of PCE costs?)

VI. Size of Road System (Does either the total mileage in a state or the mileage under state control effect the level of PCE costs?)

VII. Contracting Out (Does the level of contracting out PCE tasks to private sector firms affect the level of PCE costs?)

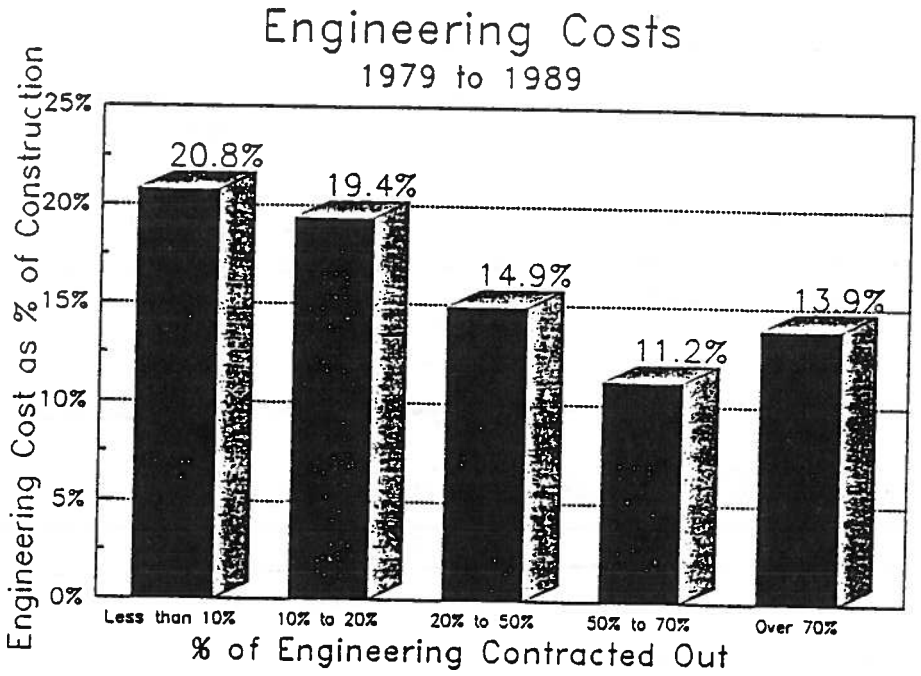
Reported spending in other areas, including administration, maintenance and safety and enforcement were also compared. None of these comparisons indicated state spending patterns with a strong statistical correlation to any of the variables tested, except contracting out.

One factor not felt to influence PCE cost relationships are the differences in construction costs (for a given amount of construction) in different geographic areas. While cost of living factors do vary by area, PSMJ Fee surveys conducted annually since 1983, have shown a close correlation between design and construction costs within a geographic area. Thus design costs remain relatively constant as a percent of construction costs in all areas.

The only statistical correlation that could be found in the data is in the percentage of PCE effort contracted out to private sector firms.

As shown in figure 2, comparing the eleven years of data for all fifty states indicates the most economical level of PCE results from contracting out 50% to 70% of all PCE.

Figure 2



PCE costs as a percent of construction show a strong correlation with 50% to 70% contracting out being the most cost effective level

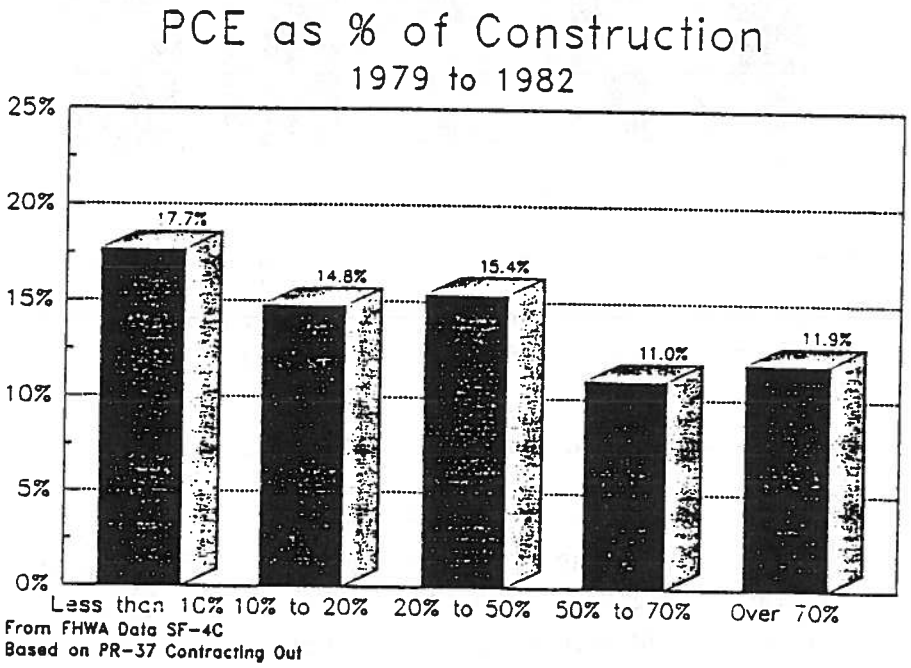
This result is not unusual, as studies conducted for both the U. S. Army Corps of Engineers and Naval Facilities Engineering Command have indicated optimum costs are achieved at the 70% contracting out level. Also the popularity of contracting out by other private and public sector facility builders would indicate contracting out is the preferred method for accomplishing engineering tasks.

PCE Costs Based on Contracting Out

The FHwA data on Preliminary & Construction Engineering (PCE) costs was tested based on a number of criteria. Most of these comparisons produced no statistically valid relationship between PCE costs and the variable test factor. Included in these tests were the relationship to total state mileage, total state transportation spending, percentage of total miles under state control and level of state fuel taxes (both per gallon and total collected).

It is only when a state's contracting out percentage is used that valid correlations are achieved in PCE costs. The data analysis clearly shows a correlation between contracting out and cost effectiveness.

Figure 2



Data for the years 1979 to 1982 also indicates optimum engineering costs are achieved by contracting out between 50% and 70% of engineering work.

It should also be noted that the states in each contracting out grouping showed no other relationship than the percentage of work contracted out. The states in each group showed wide differences in construction spending, highway mileage, traffic

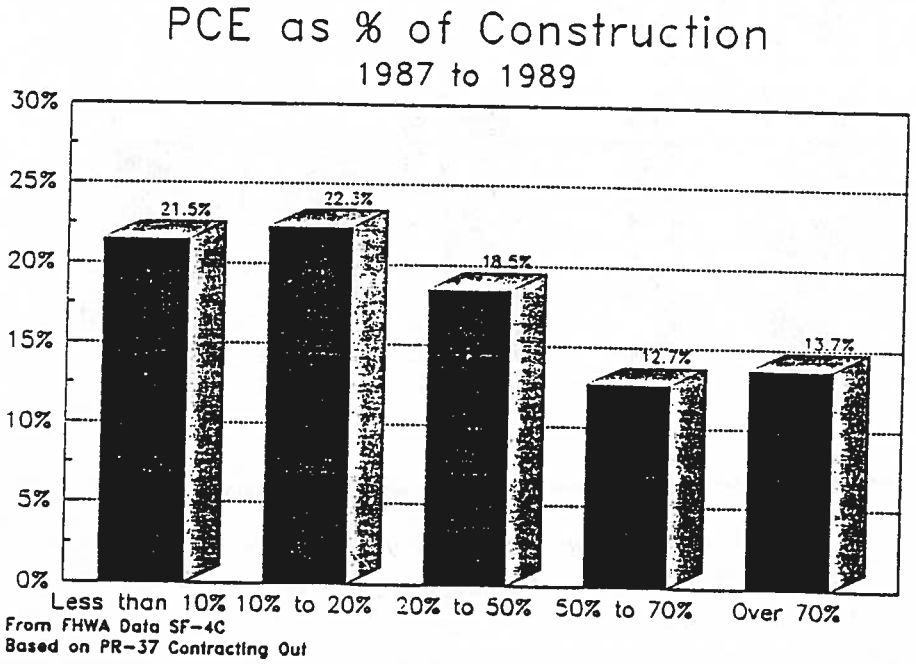
density and geographical design constraints. This finding reinforces the conclusion that percentage of work contracted out, and only this factor has a direct bearing on engineering cost effectiveness.

As shown in figure 1, the lowest cost PCE (in relation to construction costs occurs when 50% to 70% of all PCE work is contracted out to private sector firms.

In addition to the comparison of the full eleven years of FHwA data, three alternative comparisons of PCE costs based on contracting out were prepared. These comparisons used the data for the three year period from 1979 to 1982 (figure 2) and the three year period from 1987 to 1989 (figure 3). The third comparison used the data on contracting out provided by our survey of all 50 states and construction for 1987 to 1989 (figure 4).

The results of the comparison for 1979 to 1982 are shown in figure 2. Like the full eleven year comparison, the lowest engineering cost levels were achieved by states contracting out between 50% and 70% of their engineering work.

Figure 3

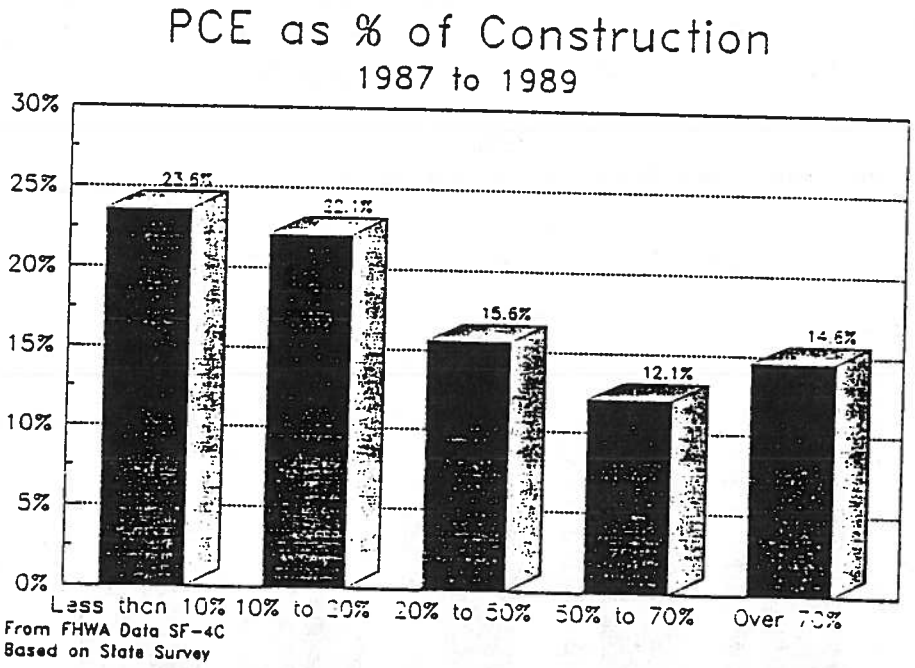


When the 3 most recent years of data available are used, the result also indicates 50% to 70% contracting out is the optimum level for cost effectiveness.

The results for the period 1987 to 1989 are shown in figure 3. The results were the same for this analysis, with 50% to 70% contracting out showing the lowest costs for PCE. From this data it appears that contracting out at this level is even more cost effective currently than it was at the beginning of the decade.

While those states contracting out less than 10% of their engineering work incurred an increase of 21.4% in their PCE costs, states contracting out 50% to 70% saw their PCE costs rise only 15.5%. Thus states contracting out 50% to 70% saw PCE costs only 59% as high from 1987 to 1989 compared with 62% during the 1979 to 1982 period.

Figure 4



Using current state contracting out policies also produced a finding that contracting out 50% to 70% of the work is the most cost effective.

No definite reason for this change could be determined. It could be related to a better ability in private sector firms to accommodate the changes in engineering practice caused by the increased use of computers. Another possible explanation is

the changing environmental rules and other factors affecting engineering skill requirements have had more impact on in-house design staff costs than in the private sector.

Whatever the cause, the data does show **contracting out has become more cost effective over the past decade.**

The survey of state DOTs conducted in conjunction with this study was used for the final comparison (figure 4). The state reported percentages were used for a comparison using only the 1987 to 1989 data as the state responses to contracting out volumes were not considered sufficiently accurate beyond this time frame.

It should be noted this state provided data is less mathematically accurate than the FHwA PR-37 data, however it does include total state design program values rather than just federally assisted project data. By using the wide brackets of contracting out activity, the lower degree of accuracy is not considered to affect the final results.

This data comparison produced even more dramatic differences in PCE cost effectiveness as the inclusion of total state contracting out efforts re-positioned several states with contracting out policies that differ on state and federally funded work.

All of these comparisons reached the same conclusion--**states contracting out between 50% an 70% of their PCE work achieve cost levels that are approximately only half as high as states contracting out 10% or less of their work.**

This study did not attempt to determine the specific causes of the results, but our conversations with state DOT personnel and factors cited in other studies of engineering costs did reveal several factors believed to contribute to this result:

- ✔ Private sector firms perform specific projects in less time than public sector design groups.
- ✔ The ability to rapidly expand or contract engineering efforts in response to variability in construction needs is better accomplished through contracting out.
- ✔ The variety of skills needed for engineering design is more cost effectively maintained on a contract need only basis rather than as full time staff.
- ✔ Projects have a better defined scope, level of effort, and schedule when formal contracts are developed with private sector firms than when projects are performed internally.

Contracting Out and Changing Levels of Construction

In government spending, construction funding is one of the most frequent areas where change occurs. Several factors contribute to this variability:

- ✔ In times of budget cutting, construction projects are often the first to be either postponed or cancelled to reduce spending.

- ✔ Construction programs are often funded with bond issues, which result in rapid increases in construction fund availability, with similar rapid declines as specific programs are completed

How frequently do these changes in construction work efforts affect transportation construction?

Reviewing the FHwA data for 1979 to 1989 found construction spending is frequently subject to significant change:

- ✔ 26 of the 50 states recorded cutbacks of 20% or more in at least one year from 1979 to 1989.
- ✔ 48 of the 50 states have had at least one year of decline in construction spending during this same period.
- ✔ All 50 states have seen gains of 10% or more in at least one year.
- ✔ 47 out of the 50 states have recorded increases in construction spending in excess of 20% in at least one year.

To determine the impact of changing construction levels in transportation and the cost impact of contracting out when change occurs, the FHwA was sorted for both increases and declines in construction funding. In both increased and decreased funding situations, states contracting out over 50% of their PCE work were better able to control PCE spending levels.

Increasing Transportation Construction Spending

When construction increases, the cost of PCE should also rise to accommodate the increased volume of work. The FHWA data was sorted to determine states with increases in construction (more than 10% on a year to year basis). PCE costs for these periods were then compared based on the percentage of work contracted out.

The results of this comparison were startling in that states contracting out more than 50% of their work were able to achieve a 143% increase in construction while PCE costs rose only 135%, indicating contracting out increased work actually lowered overall PCE costs as a percentage of construction.

On the other hand, states contracting out less than 50% of their work saw construction rise only 64% while PCE costs increased by 134%. This indicates that limited contracting out increases PCE costs faster than construction costs.

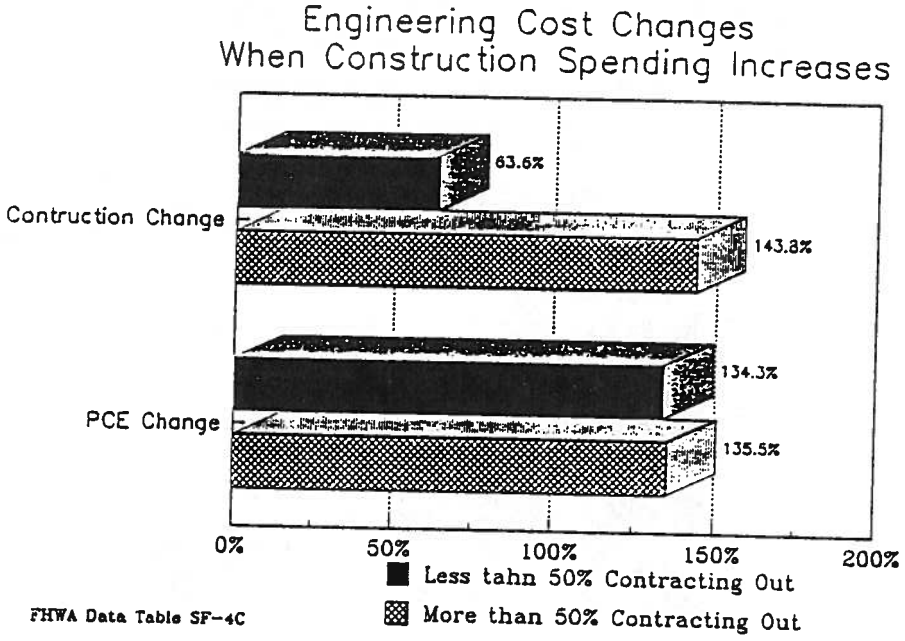
The results of this comparison are shown in figure 5.

This finding leads to several possible conclusions:

- ✔ Contracting out enables a state to increase construction spending, thus delivering highway construction more rapidly when a high proportion of contracting out is used to accomplish engineering.

✓ The effect of rapid growth in construction program funding is to reduce the cost effectiveness of in-house design efforts.

Figure 5



States contracting out more than 50% of their PCE work were better able to control PCE costs than those states contracting out less than 50%.

The Effect of Declining Construction Spending on PCE Costs

As shown in figure 6, states reducing construction spending by more than 20% in one year who contract out less than 10% of their PCE work saw an average increase in PCE costs of 123% when PCE is measured as a percent of construction.

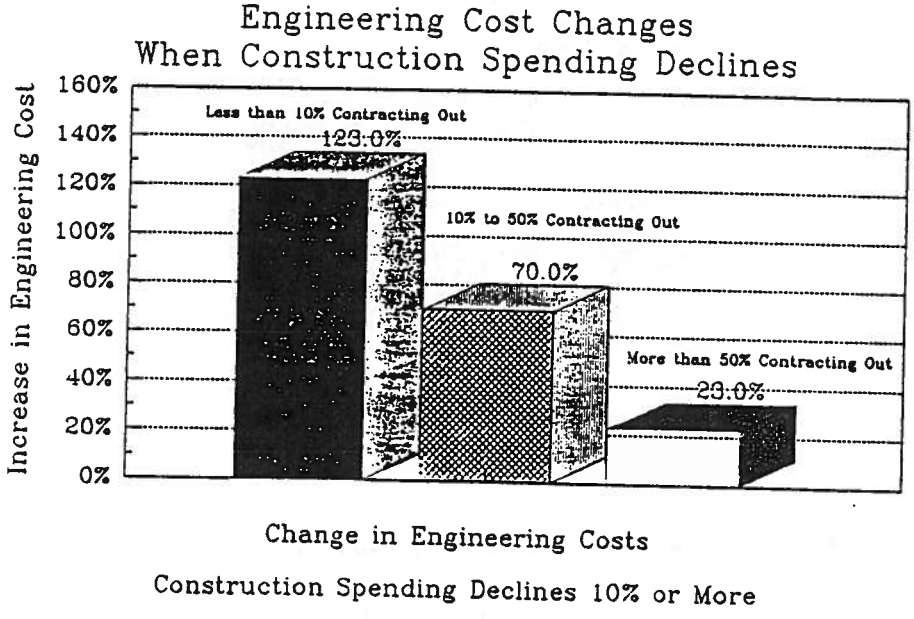
States contracting out over 10% of their work showed only a 70% increase in PCE costs as a percentage of construction.

When a comparison was performed on states experiencing a construction cutback of 20% or more, states contracting out less than 10% of their PCE work saw PCE costs rise over 300% as a percentage of construction.

Similar tests when run for states contracting out over 50% of their work showed significantly lower PCE cost rate increases. In these tests, costs increased less than 20%

The findings are clear, PCE costs are managed most effectively when construction volume decreases through substantial contracting out to private sector firms.

Figure 6



States that contract out a significant portion of their PCE work are better able to control PCE costs as construction volumes decreased.

To give an example of how construction cutbacks affect the cost effectiveness of PCE tasks, a current on-going example is the U. S. Army Corps of Engineers, where facility construction programs have been subjected to well publicized freezes due to changes expected from different East/West relationships, actions in the Persian Gulf and the need for budget cutbacks (which is delayed by Congressional action).

In a conversation with Headquarters personnel, we were told there is a trend to increase staff requirements over historical levels in order to show a need to retain staff. The result is the same level of staff accomplishing a lower level of work. This is not unexpected where staff are in-house, full time employees. Current COE pro-

jections indicate the underutilization of staff, and the inability to downsize to the staff level necessary could result in $300 to $400 million in higher than normal spending levels.

Conclusions

It can be safely concluded that transportation construction spending has a high degree of probability to be variable. PCE costs, which are directly related to construction efforts, thus should also be variable.

Variability of costs and efforts would indicate good management policies would provide for a variable level of staff or implementation of policies for contracting out the work so variable volumes of need could be met cost effectively.

Having a full time staff to accomplish a variable work effort is often the least cost effective method.

Contracting out has proven to be more cost effective in both increasing and decreasing construction programs.

The Effect of Changing to Contracting Out

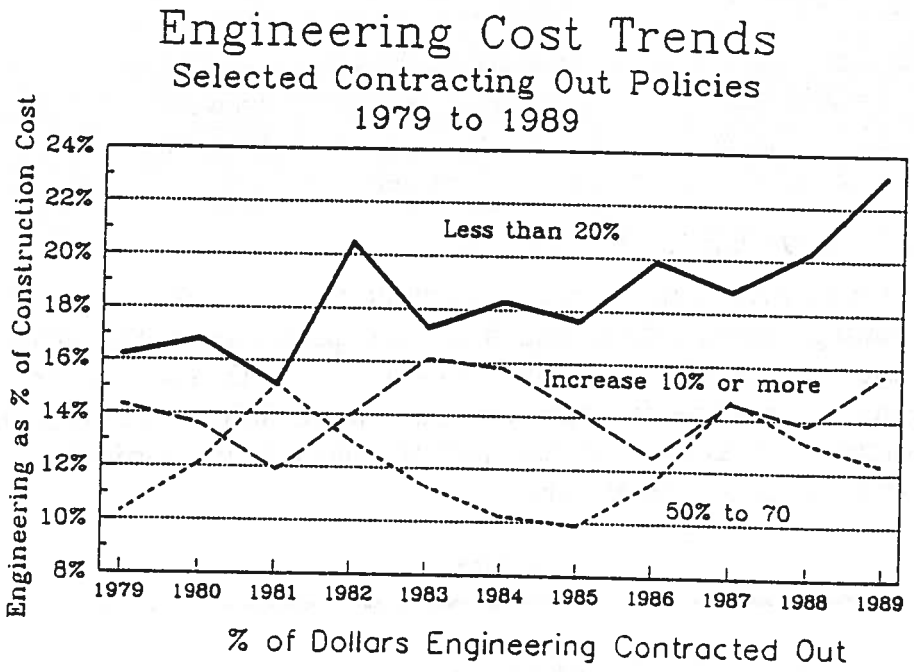
A separate analysis was performed for states that had significantly increased their contracting out (by more than 20%) over the decade of the 80s. This compared their PCE costs as a percentage of construction from 81-83 to the 87-89 time frame (figure 7).

The results of this test indicated average PCE costs as a percent of construction declined for states increasing their contracting out by 10% or more. This same data indicates that states contracted out less than 10% of their PCE work saw the largest increase in PCE costs as a percentage of construction.

One state, due to a major, deliberate legislative policy change to a reliance on contracting out to private sector firms saw their in-house staff levels decline 55% over a five year period and their contracting out of PCE work increase from 10% to 70% over the period of the change. As a result, their PCE costs as a percent of construction declined 38% over the period.

These results also confirms the finding that contracting out of PCE work is cost effective.

Figure 7



States increasing their percentage of contracted out PCE work are the only states showing stability in overall PCE costs.

Overall PCE Cost Trends (79-89)

The study found PCE costs as a percent of construction have been increasing over the past decade rising from 14.5% of construction in 1979 to 15.5% in 1989. This result was expected, as several factors have imposed additional demands for additional engineering services. Included in these factors are:

- ✔ **Increased Environmental Regulation.** Designers have to provide for increased environmental protection in wetlands and other environmentally sensitive areas. Additional requirements have been imposed for environmental studies and designs to mitigate environmental damage.
- ✔ **Increased Safety Standards.** Additional safety standards have been adopted for highways which must be incorporated into designs. Additionally, safety during construction must be given more consideration today.

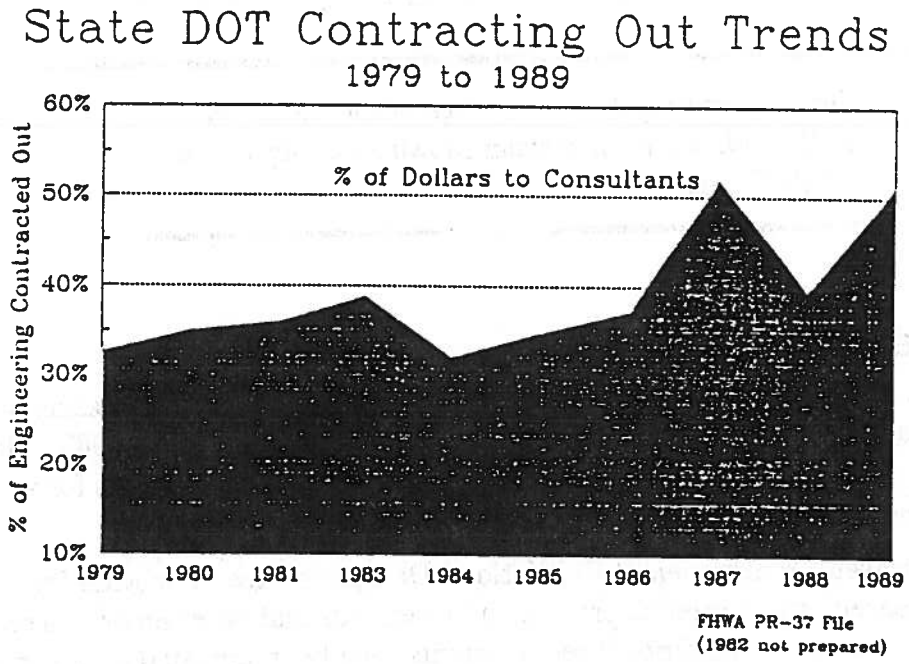
- ✔ **Neighborhood Activism.** The Not in My Back Yard (NIMBY) phenomenon has also impacted highway design. Designers must work with affected parties to avoid long and costly protests and/or litigation.

No longer can highway design be considered to be simply "grade it and pave it". These additional factors all directly impact the design of highway projects and thus PCE costs. These changes have also affected the staff skills needed to accomplish design, adding another variable to engineering needs.

How Much PCE Work is Contracted Out

The overall use of private sector design firms by state and local governments is a large and growing market. Establishing the value of private sector PCE work by state DOT agencies is a relatively straightforward process. Determining the volume at the local government level for contracting out is more difficult due to the many more government entities involved plus a lack of standardized reporting by these entities on contracting out data to FHwA.

Figure 8



The percentage of PCE work contracted out has risen steadily over the past eleven years, increasing by almost 20%.

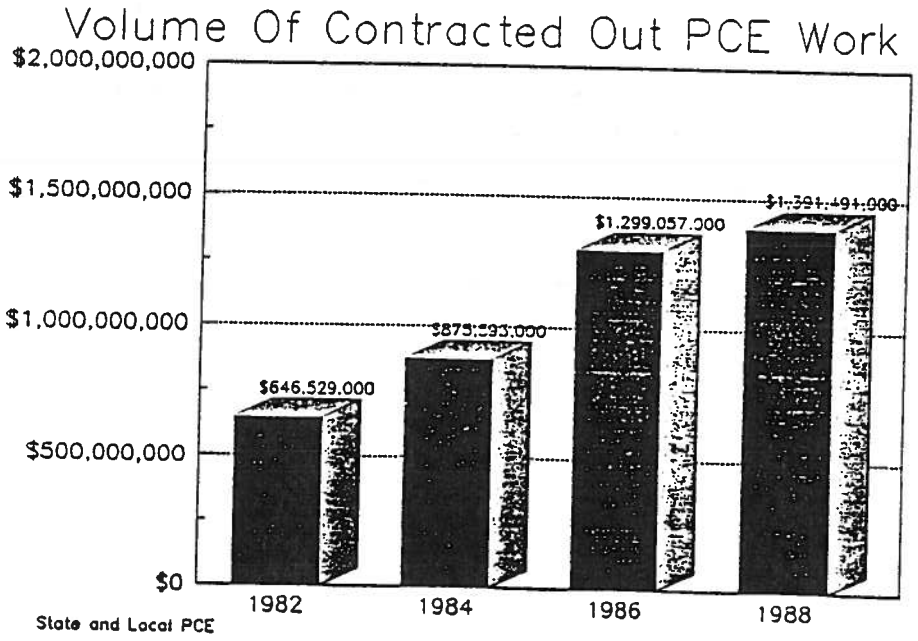
However, limited testing of major metropolitan areas indicates local government entities are more likely to contract out higher levels of PCE work than are state level agencies. Even major metropolitan areas have more limited in-house design capabilities than do most state DOTs.

The data clearly shows the volume of work contracted out to private sector firms has been growing steadily. It also shows this market is substantial.

Table 1
Volume of PCE Work Contracted Out

	1982	1984	1986	1988
State Level	$429,487,000	$639,677,000	$1,042,626,000	$1,113,466,000
Local Level	$217,042,000	$235,916,000	$256,431,000	$278,024,000
Total	$646,529,000	$875,593,000	$1,299,057,000	$1,391,491,000

Figure 9



The dollar value of private sector consultants for PCE work has been increasing steadily

These volumes are probably low since contracting out volumes for local government entities are conservatively estimated at the same percentage of total spending as their respective state agencies, when testing indicates the percent is, in fact, somewhat higher. This estimate also excludes any PCE work for special authorities, such as toll facilities, mass transit work, and direct federal work on federal sites.

This data indicates several clear conclusions:

- ✔ Government highway agencies are significantly increasing their use of private sector consultants for PCE tasks;
- ✔ The private sector has the capability to meet increased engineering needs of any state agency

Also excluded from this estimate of contracted out PCE work is work for private sector developers. Many states and localities have shifted increased responsibilities for road improvements to private developers, further increasing the volume of transportation engineering performed by private sector design firms.

In summary, the FHWA data indicates:

- ✔ PCE costs are lowest in states that contract out between 50% and 70% of their work
- ✔ PCE costs are more effectively controlled when construction spending either increases or decreases when substantial contracting out is used
- ✔ States increasing their contracting out have seen lower overall increases in spending levels for PCE
- ✔ The use of contracting out is increasing

State Survey Results

The data accumulated by FHwA includes information on contracting out of PCE tasks. This information is included in the PR-37 file which contains data from 1979 to 1989 (except for 1982 when the data was not accumulated).

FHwA points out this data is applicable only to federal aid highway funds and may or may not reflect state experience for non federal aid projects. In order to confirm the validity of this FHwA data, we contacted all 50 state DOTs.

The findings of this portion of the study are:

- ✔ The federal data on contracting out can be used as a reasonable basis for total contracting out volume on all state PCE work.
- ✔ The majority of states feel contracting out engineering work is cost competitive with in-house design costs.
- ✔ The majority of states use private sector consultants for all phases of PCE tasks.
- ✔ States have increased their use of consultants, and plan further increases in consultant use in coming years.

The questions for this state survey are included with the FHwA data in the back of this report.

Table 2 contains the findings on state contracting out policies as compared to the FHwA data in the PR-37 file.

Table 2
State Contracting Out of PCE

	Number
States matching federal data	27
States contracting out more PCE	14
States contracting out less PCE	9
	50

Generally, the differences from the FHwA data were minor, in the 5% to 10% range. Several states (28) do not track contracting out on a regular basis, so precise re-calculations of contracting out volume (as shown in table 1) were not performed.

In comparing the states to the percentage contracting out brackets set for this study, the revised state furnished numbers would change six states into brackets with higher contracting out and six states into brackets with lower contracting out.

The federal data is felt to be reasonable and if there is any difference, an accurate re-calculation would probably produce a slightly higher contracting out volume.

At the same time, we inquired of each state their policies regarding contracting out of PCE tasks and several other areas, including the type of work contracted out, what factors are considered in deciding what projects are contracted out, if there have been any changes made or planned in the future in contracting out policies and if the states felt contracting out was cost effective in comparison to using in-house staff.

The results of the survey on types of work contracted out are shown in table 3.

Table 3
Number of States Using Consultants For:

	Number
Planning/Feasibility Studies	43
Environmental Impact Studies	40
Project Design	50
Construction Inspection	31

These results indicate a majority of states use outside consultants to help with each of the major PCE task areas.

The results of the policy change questions are contained in tables 4 and 5.

Table 4
States With Changed Use of Consultants

	Number
States not changing contracting out policies	33
States increasing use of contracting out	17
States reducing use of contracting out	0
	50

One state planning to reduce contracting out cited state financial constraints on construction funding as the reason for the expected decline in the use of consultants. The other state planning to reduce contracting out is expecting to change from 95% contracting out to 80% contracting out.

Table 5
States Changing Future Use of Consultants

	Number
States not changing contracting out policies	34
States increasing use of contracting out	14
States reducing use of contracting out	2
	50

Several other states indicated they might be faced with reduced construction funding due to budget problems, but they felt this represented a temporary condition and their use of consultants would return to current levels after spending levels are returned to normal. All of the states expecting reduced contracting out due to construction funding cutbacks indicated that they felt more comfortable controlling costs in the event of cutbacks because of the use of consultants.

The last question we asked was if states felt contracting out was as cost effective as using in-house staff. The results of this are shown in table 6.

Table 6
State Comparisons of Contracting Out Costs

	Number
States that feel contracting out is cost effective	27
States that feel in-house staff is more cost effective	17
States not expressing an opinion	6
	50

Two of the states that felt in-house design was more cost effective indicated their belief was not due to a difference in engineering costs, but that outside consultants were more conservative in their design practices, resulting in higher construction costs.

Several other states felt outside consultants were more expensive due to a lack of documentation of state standards for design, resulting in excess efforts for both the consultants and the state reviewers.

Thus a majority of the states feel contracting out is cost effective, even though documentation of this was limited as only 23 states indicated they have undertaken studies of this issue. Several of these states indicated their studies were not formal, and were several years old.

States that contract out expressed several common criteria that made contracting out cost effective:

- ✔ Consultants are used for the variable load portion of design tasks. Several states indicated they have found variable load contracting out is cost effective at the district level even if overall state workloads would not require increased contracting out efforts.
- ✔ Consultants are used for specialty projects, such as bridges or tunnels where the state can not justify having the expertise in-house on a full time basis.
- ✔ Consultants are used for accelerated construction schedules where in-house staff could not reasonably be shifted to meet needs.
- ✔ Consultants are used for large, finite term construction programs as states feel it would not be cost effective to hire personnel for a project where there was no justifiable prospect their skills would be needed after the conclusion of the program.
- ✔ Consultants are used for the more difficult, or larger construction projects where the impact of project staffing needs on in-house staff levels would be the greatest.

The variability of construction design needs results in a fairly high level of contracting out in many states. These states indicated their approach is to determine the normal volume of engineering work required by type of project, and by district office to compute their base load.

When project types (such as bridges, resurfacing, new highways, highway expansions, etc) are divided by district, the volume of construction work on a continuing annual basis is well below the normal total volume of construction.

For example, if one district normally designed one bridge per year, any bridges above this level would be contracted out even if the overall number of bridge designs in the total state program did not change.

Many of the states expressed concerns over how costs could be fairly compared, as true state in-house costs were very difficult to determine fairly. Frequently cited were the costs associated with hiring and training staff, buying computers and determining a fair overhead rate for state employees. Also cited were the uncertainty of future costs, such as retirement benefits, for in-house staff.

If a general consensus were to be developed from these discussions with DOT officials, it would be that if one only looked at partial cost data for comparison, in-house staff would be slightly less expensive, but if that were true and complete state costs were able to be determined, consultants would probably be more cost effective for many projects.

Other Published Cost Studies

Several other studies of contracting out costs have been published. We have been able to identify four studies that deal specifically with transportation engineering. These are studies conducted in Wisconsin, Texas, Oregon and by the National Transportation Institute which included several states.

These studies focused on an attempt to compare the cost of single projects or single cost components (such as labor rates) rather than the total cost of engineering programs.

Federal Study

This study acknowledges the difficulty of comparing in-house to contracting out costs. This difficulty is perhaps best summed up by the statement:

> *"The archaic nature of many present accounting systems makes it very difficult to determine, with any precision, the actual total cost of utilizing in-house staff."*[4]

Thus, comparing contracting out with in-house costs on a project by project by project basis suffers from a difficulty in finding common ground for comparisons.

In fact, many of the "cost comparisons" shown in this report compare estimates to estimates and thus do not even come close to approximating an actual total cost comparison.

A typical example is a "cost" comparison prepared by the Connecticut DOT (Table 10 of the referenced study), where the estimated hours proposed by a consultant are priced both at the consultant's rates and at the states' rates. Not only is the consultant's proposal only an estimate, the state relies on it rather than preparing their own estimate of hours required.

Obviously, comparing estimates to estimates is not a reliable method for determining how actual costs compare.

Oregon Study

The same methodology of comparing estimated costs to estimated costs is used in a study prepared by the Association of Engineering Employees of Oregon.

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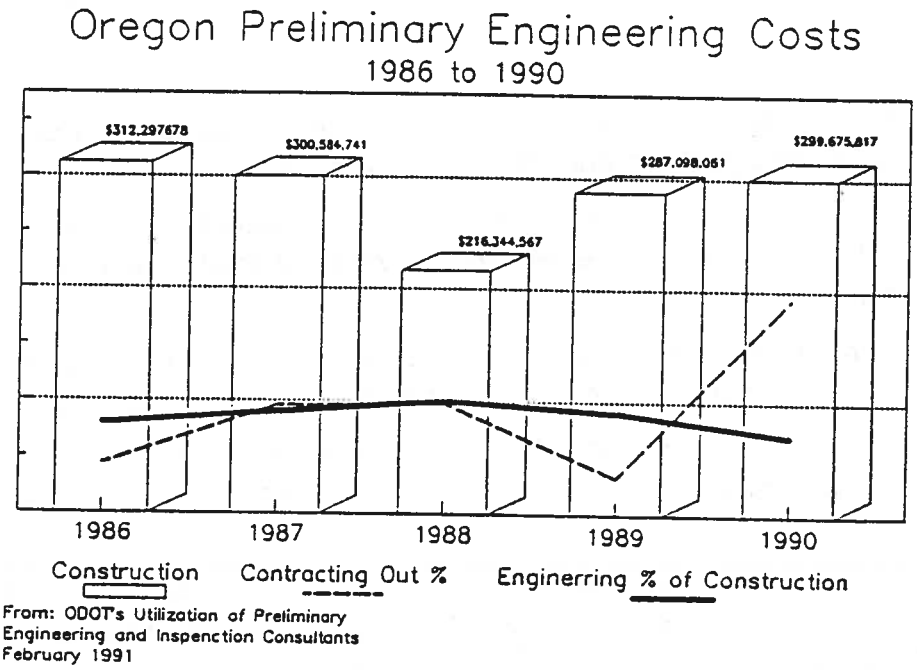
4 **Use of Consultants for Construction Engineering and Inspection,** Transportation Research Board, National Research Council, 1989, page 7

This study, using methodology of comparing estimates to estimates, concludes contracting out costs are 182% of the costs of performing engineering in-house.

The overall cost data for construction, engineering and contracting out presented in the report directly contradicts this finding.

Figure 10



From: ODOT's Utilization of Preliminary Engineering and Inspenction Consultants February 1991

In spite of the "findings" of the Oregon study that contracting out was more expensive than in-house engineering, the overall data in the report shows engineering costs declined when contracting out increased.

The report shows contracting out increased from 3% to 20% from 1989 to 1990. If contracting out was, in fact, more expensive, total engineering costs (both in-house and contracted out) would be expected to increase as the "more expensive" contracting out became a greater portion of the total effort.

Rather than increasing, total engineering costs actually decreased as contracting out increased (both in actual dollars and as a percentage of construction costs).

The possibility that costs should not be viewed on a current year basis, since engineering precedes construction and the two activities may occur in different years on the same project does not appear to refute the reduced cost as engineering costs continue to decline as a percentage of construction into 1991 according to the study.

The report's own data would certainly, at a minimum, cast doubt on the finding that contracting out is more expensive than performing work in-house and confirm the fallacy of trying to compare engineering costs soley on the basis of labor rates.

Texas Study

This 1987 study also reached a conclusion that performing work in-house was less expensive than contracting out. While this study used paired actual project experience, the costs assigned to in-house work are also estimated, as the states' accounting system was not able to produce complete or accurate cost data.[5]

The report also fails to reconcile individual cost accumulations to total costs incurred. The "finding" that in-house design costs were 2.8% of construction costs while consultant costs were 4.9% of construction are both significantly below Texas data reported by SDHPT to FHwA which shows preliminary and construction engineering costs ranged from 12.2% of construction to 19.6% of construction over the study period.

Since the report acknowledges the less than complete accuracy of the state's cost data and the findings differ substantially from total engineering program costs, the findings should be viewed with a certain amount of skepticism.

Wisconsin Study

This study was conducted by the Legislative Audit Bureau in April of 1990 in response to concerns that contracting out was costing the state more than it would to perform the engineering work in-house.[6]

The results of this study speak for themselves.

> *The volume of engineering work performed by private consultants for the Department of Transportation has increased sharply since the early 1980s. In 1982, the Department negotiated 20 contracts, for approximately $2.4 million. For 1989, the Department awarded 241 contracts, totaling $27.6 million. Currently, approximately 33% of the engineering work for highway design and construction supervision is performed by private consulting firms, up from 9% in fiscal year 1982-83. This growth in consultant use has devel-*

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5 Use of Consultants for Construction Engineering and Inspection, Transportation Research Board, National Research Council, 1989, page 15.

6 An Evaluation of Use of Engineering Consultants Department of Transportation, State of Wisconsin Legislative Audit Bureau, April 1990.

oped despite the absence of a Department policy on the appropriate level of consultant use, and has led to complaints that engineering services provided by consultants are more costly and of lower quality than similar services provided by state staff.

Our analysis indicates that for projects that have recently been completed, the use of consultants is no more costly than if state staff had been used.

We found no widespread evidence of poor consultant quality in contracted highway design projects.

It should be noted this study does not mention any of the difficulties in developing comparative costs found in other reports. Also it focuses on actual total project costs rather than estimates of cost, or partial cost factors.

One of the key findings of this study (as it relates to other studies) is "design consultants perform work more efficiently" and "resulted in in-house projects that require excessive amounts of time to complete".[7]

This finding not only refutes the basic premise in studies such as the Federal Study and the Oregon study, it also clearly demonstrates the fallacy of focusing on labor rates, overhead rates or time estimates as the sole basis for cost comparison.

Total cost incurred is the sole measure on which conclusions as to cost effectiveness should be based. It is the only suitably comprehensive measure to assess cost effectiveness.

Other Studies

Our survey of state DOT agencies revealed twenty other states that have performed studies on comparative costs of in-house and contracted out design. These states did not publish these studies as they were for internal use only.

Of these eighteen states, eight stated their studies concluded contracting out is cost effective. One state could not find a difference in cost between the alternatives.

We feel all of these unpublished studies should be viewed with a healthy dose of skepticism from the comments of DOT officials. Several indicated their studies were very limited, and several indicated they used the methodology of comparing consultant costs to in-house costs based on only the consultants time estimate to perform the work. One state indicated their comparison was limited to only comparing theur actual payroll rates to consultants full costs (including overhead) and one state compared the consultants full costs with state labor plus a labor overhead rate only (ignoring any administrative overhead).

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7 **An evaluation of Use of Engineering Consultants Department of Transportation, State of Wisconsin Legislative Audit Bureau, Report 90-9, April 1990, page 14.**

All of these studies, both published and unpublished, primarily support the following conclusions:

- ✔ The differences in conclusions of the studies serve to continue the debate on the cost effectiveness of contracting out.
- ✔ There is great difficulty in fairly comparing costs on an equal basis when a study seeks to compare detail costs.
- ✔ No study has found a decrease in quality of engineering in contracting out.

It should also be noted that numerous studies of both U.S.Army Corps of Engineers and the Naval Facilities Engineering Command (Navfac) have, over the years, pointed out the cost effectiveness of contracting out design tasks. These studies have been conducted within the agencies since 1973, and are the primary reason for the federal contracting out policies now in-place.

As a result of these studies, both USACE and Navfac now contract out approximately 70% of their design requirements. Other federal agencies (GSA, DOE, EPA) also rely on the private sector for the majority of their engineering effort.

California Engineering Cost Comparisons

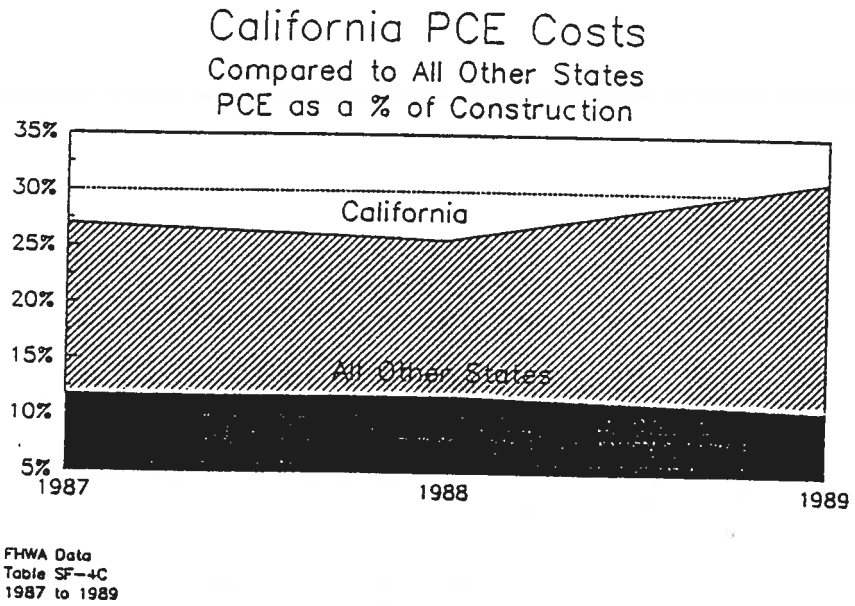
One obvious fact in the FHwA data is that California has the highest PCE costs of any state in the country, and this very high cost has been consistent since 1979.

For this portion of the study, both state and local spending from the FHwA data has been used. It is believed that a combination of state and local PCE spending is more appropriate for a detailed look at a limited number of states. Also, the practice of sharing responsibility for engineering tasks between state and local governments makes a total cost approach more appropriate for this more detailed comparison.

State and local construction and design often are not totally independent. In many states:

- ✔ States review local design efforts for compliance with state standards.
- ✔ States will observe construction of locally funded highway construction.
- ✔ State and local groups will often jointly prepare designs and fund construction.

Figure 11



When state and local PCE sending are combined, California spending levels are approximately twice the level of all other states for 1987 to 1989.

It would be overly optimistic to assume that financial record keeping clearly differentiates or separates state and local spending for PCE and construction. Therefore, it would be appropriate to test PCE as a percent of construction when both state and local spending is combined.

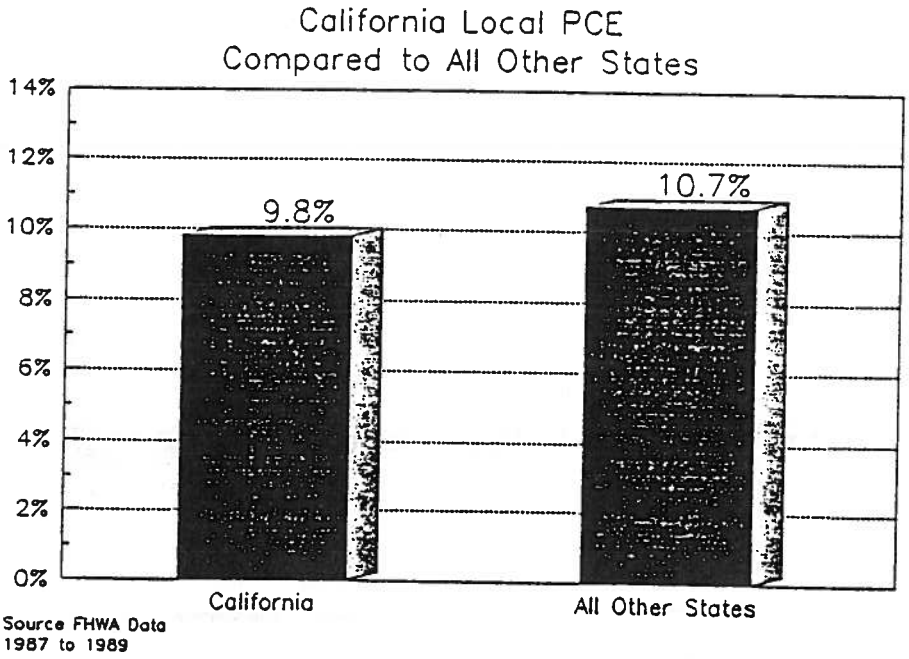
Several comparisons have been performed; California to other states with large construction budgets, California to other high traffic states, California to other mountain states and California to all other states.

These tests indicate that state level PCE costs are well above normal levels, and that effort to control costs should first look at state level PCE operations.

From the FHwA data, we have found the following:

- ✔ California PCE spending at the state level is the highest of any state
- ✔ Total California PCE spending (state and local) is approximately twice as high as the average spending in all other states

Figure 12

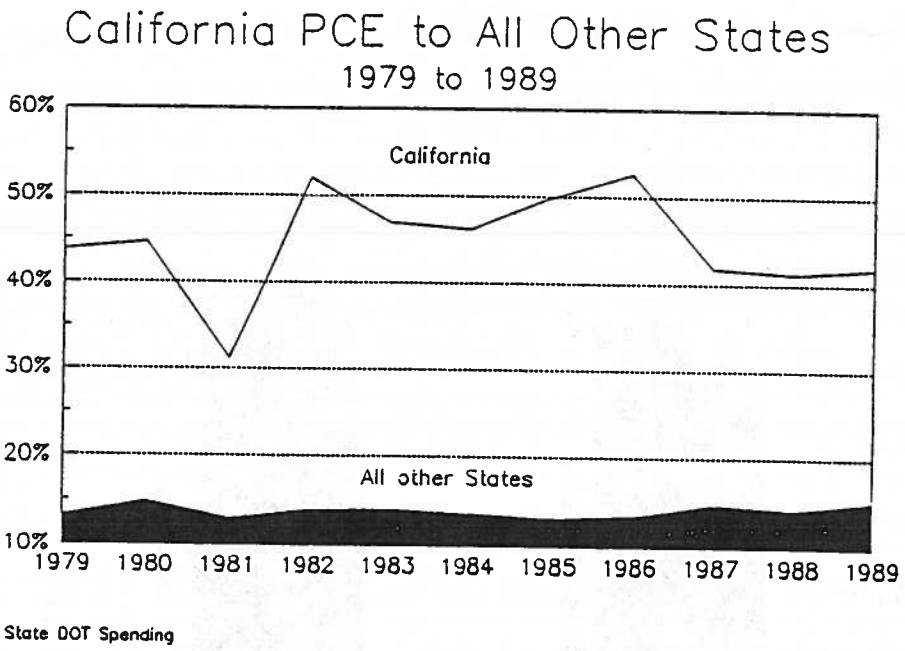


Local government PCE spending in California is almost equal to the level found in all other states.

- ✔ California PCE spending is well above the levels in other states with equally large construction budgets, miles of roads, traffic density or states with similar geographic factors affecting design.
- ✔ Local PCE spending levels are very close to typical spending levels in the other states used for this comparison.

One factor stands out in this comparison of California to other states--contracting out is more widely used by the other states and at the local level within California. Based on the overall results of this study, contracting out is a factor in engineering spending. While the lack of contracting out at the state level in California may not be the sole cause of the very high engineering spending levels, increased contracting out should be looked at as a potential methodology for reducing the high current cost of engineering.

Figure 13



State level PCE spending in California is more than three times as high as the average of all other states from 1979 to 1989.

Table 7
California PCE to All Other States
(1987 to 1989)

(000 omitted)	State Construction	Local Construction	State PCE	Local PCE	State PCE %	Local PCE %
California	$2,350,877	$2,094,911	$1,039,370	$204,654	44.2%	9.8%
All Other States	$50,207,925	$16,847,390	$7,445,371	$1,806,648	14.8%	10.7%

(3 year total 1987 to 1989)

State and Local Comparison Within California

Another comparison performed is for PCE spending within California by the various levels of government. The results of this comparison are show State level spending for engineering is well above spending for either counties and towns or municipalities. This is shown in table 8.

Table 8
Construction and PCE Spending Within California - 1987 to 1989

(000 omitted)	Construction	PCE	PCE as Percent of Construction
State	$783,626	$346,457	44.2%
Counties and Towns	$179,003	$1,415	10.0%
Municipalities	$519,300	$50,367	9.3%

(Average single year based on 1987 to 1989)

Since all of the entities are within California, it can be assumed all geographic and mileage factors are comparable. While there is some sharing of PCE responsibilities between the state and local governments within California, some degree of shared responsibility also exists in all other states.

The data shows local government PCE costs within California are relatively normal when compared with the rest of the country. The out-of-line costs are at the state level, where engineering spending is a much larger portion of construction costs.

California to Other Large States

California totals were also compared to the other states with large construction budgets. This comparison is shown in table 9.

Table 9
California PCE to Other Large Construction States

(000 omitted)	State Construction	Local Construction	State PCE	Local PCE	State PCE %	Local PCE %
California	$2,350,877	$2,094,911	$1,039,370	$204,654	44.2%	9.8%
Florida	$2,593,556	$1,080,442	$586,549	$117,351	22.6%	10.9%
Illinois	$2,817,795	$668,071	$382,370	$111,690	13.6%	16.7%
Pennsylvania	$3,679,333	$378,250	$217,361	$38,205	5.9%	10.1%
New York	$3,033,579	$1,936,631	$222,464	$226,073	7.3%	11.7%
Texas	$4,874,513	$2,245,646	$673,537	$268,821	13.8%	12.0%
Large State Average	$16,998,776	$6,309,040	$2,082,281	$762,140	12.2%	12.1%

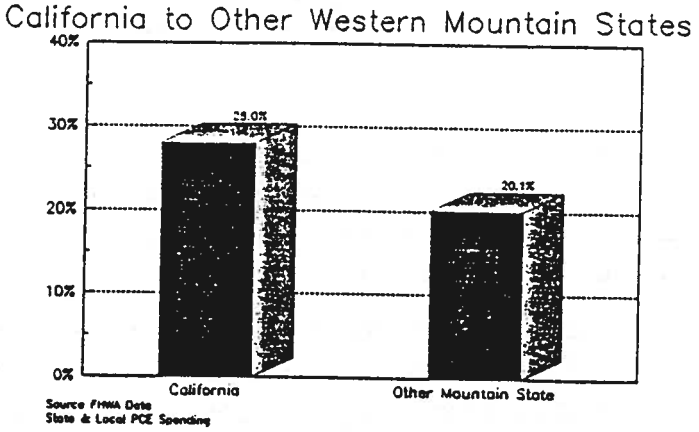
(3 year total 1987 to 1989)

As in the previous comparison, local spending within California appears to be at normal levels, but CALTRANS PCE spending far exceeds normal levels.

California to Other Mountain States

Comparing California PCE costs (combined state & local) to other Western Mountain states shows California spending levels to be higher. While the other western mountain states expend 20.1% of construction for PCE, California spends 28.0% (combined state and local).

Figure 14



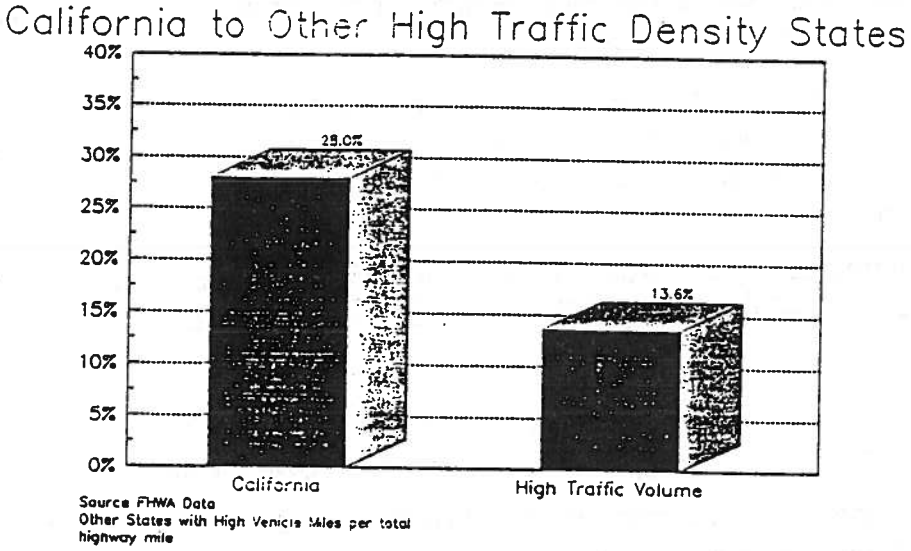
Combined state & local spending in California on engineering is higher than in other western mountain states.

Note this comparison is limited to western mountain states to more closely match the geographic constraints imposed on construction. A comparison that included eastern mountain states showed an even greater difference in PCE spending levels between California and the other states. It should also be noted the eastern mountain states contract out a higher percentage of their PCE work than the other western mountain states. This difference would further support this study's conclusion that increased contracting out is a factor in controlling PCE costs.

California to Other High Traffic States

In testing for mileage related factors, traffic density, measured as vehicle miles per mile of highway, was also used to test for PCE spending. A heavy traffic density could be related to engineering costs as the highways and roads could require more design effort to accommodate heavier volumes of traffic.

Figure 15



Total PCE spending as a % of construction in California is more than twice as high as other states with high vehicle miles per mile of highway.

California ranked third in traffic density among all the states, at 1480 vehicle miles per mile of highway. It is well below the most heavily trafficked highway system

(1829 vehicle miles per highway mile). The top ten states for traffic density (densities above 925 vehicle miles per mile) were compared for combined state & local PCE costs.

California spending for PCE was more than twice as high as the average spending in these other high traffic states.

Other mileage related factors were not tested as California data did not indicate a high ranking for the state. Both construction per and miles under state control showed California is near the average for all states. Since California values do not appear to be out of line with average, these factors can not offer valid reasons for California PCE spending levels to be high.

Other Geographic Comparisons

California contains a wide variety of geographic conditions that affect construction in addition to mountain areas. These would include coastal regions and large metropolitan areas. Separate comparisons of each of these conditions were not prepared as many of the states that would be appropriate for such comparisons are already utilized in the previous tests.

The states used in the large state construction program comparison also contain a number of states with extensive coastal regions, as does the mountain comparison. The states in the large state construction program also contain states with major metropolitan areas.

Since the comparative states would be the same as other comparisons, the results would be the same-California spending for PCE is higher than other states.

Overspending

Table 10 shows the spending levels California would have incurred if the state had achieved the same level of engineering costs as the average for the 49 other states.

This comparison shows that from 1979 to 1989, California spending totaled more than $1.7 billion more than if spending was at average engineering cost levels. With California increasing transportation construction spending, the most recent years show spending at excess levels of better than $200 million per year.

Table 16
Excess PCE Cost California
1979 to 1989

Year	All States Construction (1)	All States PCE (1)	PCE %	California Construction	PCE Cost at 49 state % of Construction	Actual PCE	Excess PCE Cost
1979	$8,088,831	$1,082,662	13.4%	$296,025	$39,622	$129,700	$90,078
1980	$8,328,831	$1,130,663	13.6%	$272,842	$37,039	$121,698	$84,659
1981	$9,060,546	$1,178,095	13.0%	$378,021	$49,152	$117,589	$68,437
1982	$9,483,623	$1,324,520	14.0%	$327,853	$45,789	$170,476	$124,687
1983	$10,323,791	$1,452,386	14.1%	$331,895	$46,692	$155,773	$109,081
1984	$12,061,257	$1,657,139	13.7%	$451,980	$62,099	$209,066	$146,967
1985	$14,650,106	$1,926,587	13.2%	$534,035	$71,413	$271,094	$199,681
1986	$15,289,747	$2,061,984	13.5%	$523,559	$70,607	$275,304	$204,697
1987	$16,030,421	$2,376,598	14.8%	$734,038	$108,827	$306,974	$198,147
1988	$16,998,259	$2,436,991	14.3%	$786,220	$112,718	$324,547	$211,829
1989	$17,179,245	$2,632,782	15.3%	$830,609	$127,294	$407,849	$280,555
Totals	$137,494,768	$19,260,407	14.0%	$5,476,087	$771,252	$2,490,070	$1,718,818

(000 omitted)

Conclusions

Clearly, California PCE spending levels are very high. The differences in PCE costs can not be attributed to the level of construction funding, traffic density, or geographic factors. The primary cause of the high PCE spending is at the state level and thus the state level appears to offer the most opportunity to change PCE policies to achieve more effective spending.

Contracting Out Data in Other Construction Markets

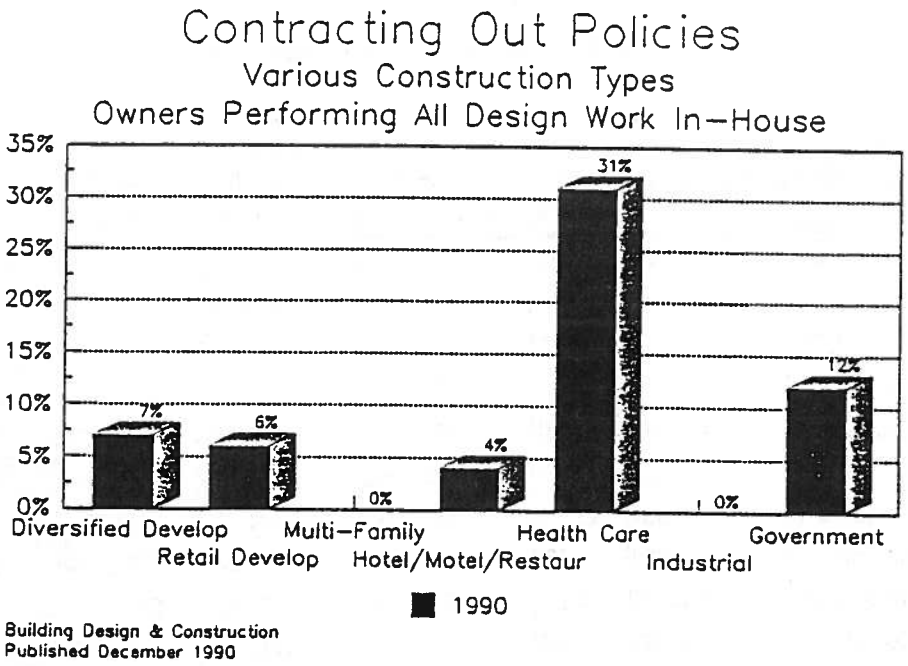
The use of outside, private sector design consultants is common, not only in transportation but in all other major construction types.

In December 1990, *Building Design and Construction* magazine published its annual survey of facility owners. Two of the key results are:

- ✔ The use of outside consultants has been increasing since 1986, except in facility types where construction volumes have decreased.
- ✔ Only a small fraction of the owners perform all design work in-house.

These results are shown in figures 16 and 17.

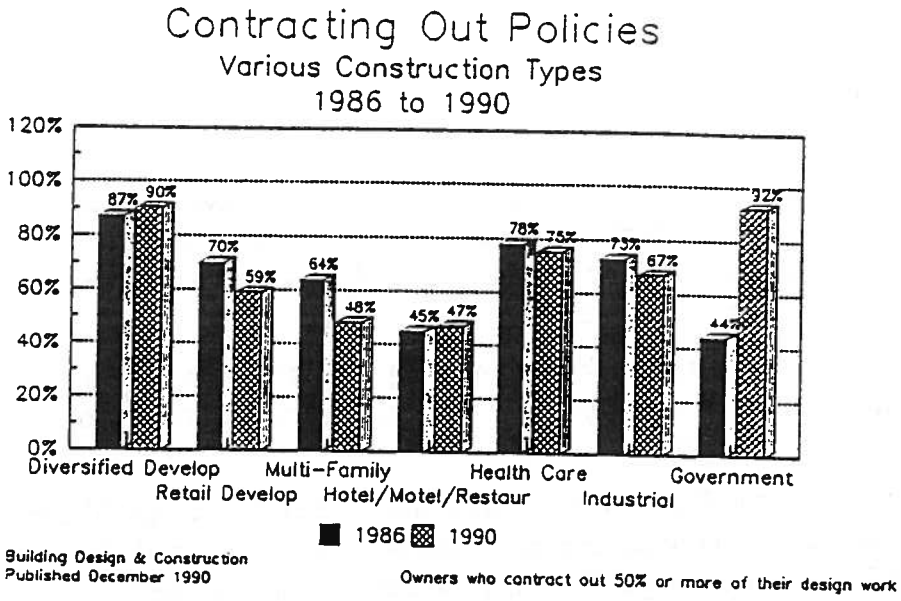
Figure 17



Only a minority group of engineering service users perform all design work with in-house staff.

While this survey is not intended to be comprehensive of all facility owners, the data covers owners who reported construction dollar spending of $49.7 billion. A sample this large is believed to be a valid representation of the construction market as a whole.

Figure 18



A majority of engineering users contract out over 50% of their design work

Of the builder types, retail developers, multi family housing developers, health care developers and industrial developers showed declines in the number who contract out over 50% of their work. These owners also showed a drop in the value of construction over the period. There reported construction value decreased from $21.0 billion to $19.4 billion (without factoring in any inflation factors).

This decline in the value of construction is believed to be the reason for the decline in the use of outside consultants. Declining construction has caused owners to reduce consultant use without impacting employed staff.

Other Considerations

The results of this study clearly indicate contracting out engineering tasks is a primary factor in determining overall cost effectiveness. What are the underlying factors that contribute to this result?

- ✔ Private sector engineering design is a highly competitive market. Competition is a more cost effective approach to accomplishing a task. Eliminating competition by performing all work with a dedicated work force creates a non-competitive situation and can lead to higher costs.
- ✔ Construction creates variable engineering support needs. The total amount of construction will vary from year to year, creating a variable volume of engineering work effort.

  Within a given dollar value of construction, the engineering skills needed will also vary. The skills needed for bridge design are very different from the skills for road design. Within a project, the skills needed for planning are different from engineering. The skills needed are also different for construction supervision.
- ✔ Engineering design often is best accomplished with specialized skills. Contracting out allows agencies to use these specialized skills on an as needed basis rather than having the responsibility for full time staff.
- ✔ Several other studies have indicated that private sector management tools, and the need to stay within contracted scope and schedule lead to more efficient project performance by the private sector. This is not to say agencies can not manage effectively, but that apparently they do not manage effectively in more cases than the private sector.
- ✔ In-house design staff levels are less readily able to be changed as construction volumes change. Owners are able to adjust staff levels more quickly in response to change when the staff is hired on an as needed contract basis.

Managing the varying needs for skills in a constantly changing environment would indicate contracting out to use only the skills currently required would be more cost effective.

Certainly contracting out is not the sole cause for maximum cost effectiveness, but it is one factor that helps achieve maximum cost effectiveness.

Study Methodology

The study of contracting out policies and Preliminary and Construction Engineering (PCE) costs is based primarily on data reported to FHwA by state and local government sources. FHwA complies and edits these reports into their published annual report entitled, "Selected Highway Statistics and Charts".

The information in the FHwA reports was supplemented by a phone survey of state DOT agencies. A copy of the questions asked of each state follows this narrative.

Supplemental information sources on contracting out policies are listed in the Bibliography of this report.

There is some concern that states use different standards to classify costs in their reports to FHwA. FHwA exercises care in the gathering of data and has worked closely with all states and localities over the years to standardize the reporting of data by the states and to report the information on a consistent basis from all states and localities.

Quoting from the Introduction section of the annual report,[8]

> *"Statistics in this publication have been analyzed and reported on a calendar year basis for the most part, using procedures that provide comparability of values among states. Therefore, some values reported here may differ from values reported by other agencies for similar items."*

The statistics reported are gathered on the basis of actual spending by FHwA category, and thus will differ from data prepared on a fiscal year basis, a budget basis or on the basis of state adopted spending categories different from the FHwA standard.

Another issue to be addressed is the appropriateness of comparing same year data for PCE comparisons to construction, since by definition, preliminary engineering must precede construction and the total period for project engineering and construction may exceed a single year.

This issue is addressed by:

A. Inclusion of cost data from 1979 to 1989, thereby minimizing any distortions caused by one year changes in activity.

   Users should thus view the results as trends rather than focusing on any one year period.

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8 **Highway Statistics**, Federal Highway Administration, PL 89-003, 1990

B. The PCE category includes engineering services during construction. While exact percentages of construction engineering to total engineering are not available, the ratio is between 25% and 35% of total costs (per several state estimates). Thus a significant portion of total PCE costs are incurred in the same time frame as construction spending.

C. The nature of the primary funding for highways is a dedicated gas tax and multi year federal highway funding source. Thus, revenue available is fairly level from year to year, making multi year trends valid.

D. Conclusions drawn from the data are based on a minimum three year time period rather than from any one year. The use of multi year data minimizes the potential impact of an unusual occurrence in any one year affecting the study conclusions.

Local spending was only used for the three year period from 1987 to 1989. This was used only to minimize any potential effects from split responsibilities or shared resources between levels of government. Data prior to 1987 for local governmental units was considered to be too incomplete to provide substantiation for conclusions after discussions with FHwA regional and Washington offices.

FHwA feels the information provided by local government units is accurate, but it is incomplete due to non-participation by some local governmental entities.

The supplemental survey of state DOTs was developed to enable the use of FHwA data that is gathered only for federal assistance highway projects by determining if the same policies were followed for non federally funded work.

Each state was asked if the contracting out percentage in the federal data was also applicable to state funded work. If the answer was yes, the federal data was used as the basis for this study. If the federal data was not appropriate for the total state program, the states own volume of contracting out was used. This data was used only for the comparisons of 1987 to 1989 as the data would not be as applicable to prior years due to many states not recording this information on a continuous basis.

State: _____

Contact: _____

Title: _____

Phone: _____

Address: _____

_____

Federal Data:

Avg $ PCE _____

Avg % PCE _____

Comments: _____

_____

_____

Date Contacted: _____

1.	*Is policy on use of consultants the same or different on federally funded work than on state work?*	Same	Dif
2a.	*Do you track total dollar value of consultant PCE?*	Yes	No
2b.	*If so, how much in latest year?* Year _____; $ or %_____		
3a.	*Do you track consultant PCE projects as % of total construction?*	Yes	No
3b.	*If so, what is % of latest year?* Year _____; %_____		
4.	*Do you use consultants for:*		
	a. Planning/Evaluation Studies	Yes	No
	b. Environmental Impact Studies	Yes	No
	c. Project Design	Yes	No
	d. Construction Period Services	Yes	No
	e. Construction Management	Yes	No
5.	*What factors do you consider in choosing to use a consultant instead of department employees?*		
6.	*Have you changed policy on use of consultants over the past few years?*		
7.	*Are you planning to change policy on use of consultants?*		
8a.	*Are consultants cost competitive with in-house design?*	Yes	No
8b.	*Have you done a study of this?*	Yes	No

FHWA DATA

The following data is from FHwA. The primary data source is the annual Highway Statistics publication.

This report is complied, annually, from data submitted by state and local governments. Three important points regarding this data:

1. The data is for actual spending on a calendar year basis. Thus, the data will vary from either state budget/appropriation figures or reports prepared on the basis of a state's fiscal year.
2. The data is gathered on the basis of FHwA definitions that may be somewhat different than state/local definitions for particular spending categories.
3. FHwA staff review the data for consistency and conformity with their guidelines to verify the data for all states is consistent.

From our discussions with FHwA staff, their belief is all data submitted by the states is accurate, including the spending data used in this study. These personnel expressed some doubt as to the completeness of local spending data. These doubts were not about the accuracy of data submitted, but about its completeness as they are uncertain if every local government unit submits data.

Accordingly, this study relies primarily on state level data.

The spending categories used in this study are defined by FHwA as follows:[9]

> Item A.1.b. Preliminary and construction engineering.-Include the following expenditures: field engineering and inspections; surveys, material testing, and borings; preparation of plans, surveys, and engineering (PS &E); and traffic and related studies.
>
> Item A.1.c. Construction of highways.-Include the following classes of expenditures for construction, 3R/4R, (resurfacing, restoration, rehabilitation and reconstruction), restoration of failed components, additions and betterments:
>
> - Construction of roads includes roadway earth work and grading; drainage and related protective structures; base and surface or resurfacing; shoulder and approach surfac-

9 Text from FHWA Notice N 5600.9, January 7, 1991, page 8-8, instructions for completing form FHWA-532

ing, including turnouts, interchanges, frontage roads, climbing lanes and parking areas; utility relocation; and environmentally related improvements.

- Construction of major structures includes: bridges; viaducts; grade separation structures, overpasses and underpasses; vehicular tunnels and subways; sewer and drainage systems, walls and roads over dams; and ferries and landings.
- Installation of traffic service facilities includes the cost of building or installing specialized facilities designed to aid, direct, regulate or control vehicle use of the highways. (Report costs of weighing, inspections and highway patrol facilities in item A.5.)

Note these categories do not include any costs associated with right of way acquisition, including administration of right of way costs.

FHwA also tracks state costs for engineering of federal aid projects in the PR-37 data file. This data is accumulated for both total reimbursed costs and for contracted out costs. The PR-37 data was used to determine the state volume of work contracted out.

The PR-37 data file was not prepared for 1982 (current staff contacts with FHwA could not explain why this was not done).

The survey of all fifty states conducted for this survey included verification of state contracting out volume. Both the PR-37 data and the adjusted contracting out volume produced the same findings as to the cost effectiveness of contracting out.

The state survey was conducted in March of 1991, and is of 90-91 values, and was conducted to place each state in one of the contracting out percentage groupings for the purposes of this study, and thus did not attempt to precisely quantify contracting out volume.

This study resulted in six states being moved to higher contracting out groupings and six to lower contracting out brackets, with no overall significant impact on the data analysis.

Additional Highway Statistics data used for testing the cost of engineering included mileage, vehicle miles and administration costs.

Federal Highway Statistics (for the year indicated)
Preliminary & Construction Engineering
Table SF-4C (000 omitted)

State	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Alabama	12724	12358	13421	11145	14133	15530	20664	17263	12818	26857	22029
Alaska		22430	18846	26711	33928	20925	31076	36787	36260	36142	48423
Arizona	21974	32538	31240	8496	30962	29755	32862	40459	51209	67508	68731
Arkansas	16878	19222	11110	18322	18752	18888	26781	31610	29080	29325	28730
California	129700	121698	117589	170476	155773	209066	271094	275304	306974	324547	407849
Colorado	21517	24687	27584	29802	35746	36174	45213	49324	48402	55688	54398
Connecticut	21605	24779	29714	27180	37202	42153	57054	75320	86316	96796	148213
Delaware	5944	7312	8557	9231	12481	13039	14445	13814	14589	17545	23077
Florida	60129	90379	45097	47145	52341	53755	72766	79667	165728	220200	200621
Georgia	38149	38399	42912	46704	55478	83032	65881	52599	59394	88102	89741
Hawaii	10546	9966	7794	12825	14104	15971	15333	13836	18037	23203	29717
Idaho	6740	6193	6855	7875	9486	12008	14390	13583	13020	15872	15813
Illinois	52537	62488	65244	63403	64804	77662	95469	109354	141490	116178	124702
Indiana	16830	19339	23226	38973	3055	6311	13509	25862	34973	12144	17463
Iowa	21880	20511	17645	17077	18824	19252	20549	20953	21667	24623	22395
Kansas	5504	7925	8461	6827	9414	9012	7952	27379	26384	28778	31174
Kentucky	39809	42059	37147	41425	51086	54494	60691	84164	62677	72039	58566
Louisiana	40855	39768	51095	58992	59936	49881	50680	45731	40703	38266	36072
Maine	8792	8108	7515	9059	7790	8921	21772	19515	14690	16329	19704
Maryland	14711	16066	14428	29867	20776	29752	38948	46045	114173	67406	67724
Massachusetts	28196	32500		8050	34367	54055	57081	56788	46016		96379
Michigan	38667	31875	32102	34327	27387	36304	41988	49251	54818	51099	63207
Minnesota	30079	36063	18685	31645	38781	41706	47399	54827	55676	50864	61291
Mississippi	19002	20149	18725	22297	23173	22430	23771	26622	29963	30355	34348
Missouri	16910	12241	10726	8216	10711	15116	19125	19552	42336	45592	42910
Montana	16667	22338	19897	4347	4644	5418	6501	6993	8311	8803	4892
Nebraska		10632	10549	12618	15514	15826	15320	16844	16669	18705	22321
Nevada	14045	11085	10706	10641	10848	13771	14456	14896	14385	20116	25735
New Hampshire	4423	6452	6824	8130	7935	8235	9079	9721	8766	12756	13434
New Jersey	8921	9221	32730	13701	17909	31042	38321	43824	86124	77664	58425
New Mexico	2457	3327	11636	16009	17402	20362	57062	27454	31094	14299	13210
New York	38596	40625	52481	103834	73765	83811	106827	86423	65983	66168	90313
North Carolina	44365	54750	35889	43057	43693	55750	67290	69553	75069	82848	93249
North Dakota	6892	7185	7780	6704	10470	11121	9136	7563	6829	6580	7154
Ohio	10744	9428	25394	33217	36150	47207	47911	50423	54866	54899	60608
Oklahoma	17090	18344	20864	21773	20599	20664	21567	22887	24032	26298	25198
Oregon	15424	18686	19949	20675	24427	27480	31659	25887	39906	26630	40000
Pennsylvania	34181	27883	29301	46684	59708	67849	62814	72550	70535	72763	74063
Rhode Island	6999	7699	8161	13641	13777	22113	24127	26208	31344	29968	38984
South Carolina	16870	17985	5441	16749	28763	33163	28495	30394	36999	41578	47381
South Dakota	5322	6067	5589	5206	6385	11716	7174	6455	7726	9387	8669
Tennessee	40394	47816	40820	35820	45019	41693	51901	52575	54651	69327	66318
Texas	82887		113377	122078	129970	139084	156818	185896	228785	231811	212941
Utah	19000	25375	26000	26000	27000	31000	40000	39000	34000	36200	40000
Vermont	3190	3192	5731	7196	3656	4877	5095	9235	6211	8747	
Virginia	41342	51855	48285	45670	49839	51519	58006	73972	99138	134579	131994
Washington	48089	46511	46070	44586	59564	81773	100896	100130	90644	83382	75426
West Virginia	28865	16775	13110	10763	15164	15263	19955	20724	14502	19249	13182
Wisconsin	13836	16043	16770	21388	23274	26563	22889	28717	31094	34517	41487
Wyoming	12085	14034	16612	18439	22194	23713	27889	23355	18516	18806	22370

FHWA DATA

Federal Highway Statistics (for the year indicated)
Construction Costs
Table SF-4C (000 omitted)

State	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Alabama	215488	152097	245283	208990	257645	281392	396283	347793	286491	353349	353165
Alaska		80633	104826	81384	100956	130254	78346	110562	97213	101238	106582
Arizona	126101	119683	125654	122287	119004	168209	245711	211261	360739	425873	301226
Arkansas	130702	183571	134364	127120	120995	128660	218864	242434	200360	184197	156751
California	296025	272842	378021	327853	331895	451980	543035	523559	734048	786220	830609
Colorado	123845	125151	87269	98510	122494	156836	194787	213380	212839	217321	174059
Connecticut	94159	119487	118515	110177	144953	166246	227562	300700	349808	393054	599784
Delaware	24886	37251	71409	57463	68640	83122	78204	83236	89379	112442	96533
Florida	326918	497448	52368	481410	406154	426172	768039	747935	872234	953541	767781
Georgia	291495	351789	458109	292668	509062	373200	671845	463855	536886	478657	480005
Hawaii	42772	40417	46484	56679	72412	62014	44817	43977	44518	53385	44264
Idaho	50552	38204	43576	37337	58556	69136	81108	80127	59124	103015	95142
Illinois	470370	659775	551955	544959	629640	836604	951599	508430	780802	1003951	1033042
Indiana	83556	54305	61215	173246	199275	240012	287523	340450	154070	353812	347953
Iowa	148465	100967	130486	126303	143192	254185	257952	230966	215152	249301	256955
Kansas	126777	179265	152073	123572	109055	200129	259256	242251	242546	189896	192864
Kentucky	301536	318712	305116	260244	275000	332347	338562	281816	359516	417281	332981
Louisiana	211810	293042	460422	436808	461637	391527	415193	513325	365694	345179	360643
Maine	33681	31612	49764	64176	56094	69684	84116	70092	78811	75751	84113
Maryland	110044	55518	131569	210887	215127	328210	374910	384504	426527	552759	605533
Massachusetts	164656	258553	0	182218	115424	146065	184721	177754	235733		182145
Michigan	297878	251909	178097	190765	190059	303112	275213	370445	394665	400956	369090
Minnesota	103218	108034	187531	197341	229029	316297	340339	352844	401203	385185	436357
Mississippi	176230	198516	173944	168874	155081	150106	168287	199635	184915	186942	168229
Missouri	269919	214400	177690	192813	204139	294124	365004	383923	255884	347075	260735
Montana	69465	120429	103522	76642	101140	143993	156058	156301	101727	146014	131308
Nebraska		58944	87180	84110	121172	130960	137534	140272	99275	156923	159153
Nevada	60239	87536	75961	79851	73825	84069	112974	127685	84303	124293	150264
New Hampshire	71177	44378	29350	66304	42969	48199	66241	56377	58159	60386	58080
New Jersey	123619	129000	182297	184327	180668	313389	452443	611837	739653	370705	742035
New Mexico	76041	91330	144615	143346	164185	196438	135583	166459	180128	203752	228989
New York	724508	607892	545210	550429	595818	682046	795348	830479	900966	862071	1270542
North Carolina	284294	308464	228897	177348	195135	240447	314784	299501	357163	395454	357192
North Dakota	43610	37215	49993	43283	79002	82299	77740	64560	65817	70752	54882
Ohio	283274	250747	261955	340619	338409	466346	596088	493797	569551	603506	477035
Oklahoma	93773	119116	165996	172979	196797	210517	239576	244302	233079	264522	211777
Oregon	70569	172620	134471	138510	153364	137299	163464	171524	159579	172888	182131
Pennsylvania	152197	283330	514766	606603	525088	671367	1004927	1166833	1236405	1206523	1147905
Rhode Island	16360	17996	19337	25521	29416	43108	58274	86470	92181	105185	105248
South Carolina	100672	98073	107682	111124	117780	149153	180501	174540	236006	237223	209147
South Dakota	49779	59041	63673	54148	70766	94062	102355	83541	75975	103939	93419
Tennessee	203262	246446	214443	171408	251713	227907	259076	229718	266326	381211	345816
Texas	697807		943734	814232	797502	803250	800102	1521588	1506989	1781133	1586391
Utah	93829	110925	99462	76900	118836	158000	195392	155437	135628	174693	226796
Vermont	23084	21464	39478	48227	26021	33437	34358	62522	41836	39186	
Virginia	296851	290401	268750	246907	339259	307210	434322	531217	642718	713493	648020
Washington	183087	165577	216350	276410	289294	290526	355848	360531	358824	328430	330927
West Virginia	234347	318710	279634	208364	195769	239625	293457	293532	316717	213888	193694
Wisconsin	141140	125185	133296	139736	229324	237177	195942	225318	248673	278721	344655
Wyoming	70789	93784	102775	100064	126916	162790	179478	133711	117634	119208	117907

Federal Highway Statistics (for the year indicated)
Preliminary & Construction Engineering as a % of Construction

State	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Alabama	5.9%	8.1%	5.5%	5.3%	5.5%	5.5%	5.2%	5.0%	4.5%	7.6%	6.2%
Alaska		27.8%	18.0%	32.8%	33.6%	16.1%	39.7%	33.3%	37.3%	35.7%	45.4%
Arizona	17.4%	27.2%	24.9%	6.9%	26.0%	17.7%	13.4%	19.2%	14.2%	15.9%	22.8%
Arkansas	12.9%	10.5%	8.3%	14.4%	15.5%	14.7%	12.2%	13.0%	14.5%	15.9%	18.3%
California	43.8%	44.6%	31.1%	52.0%	46.9%	46.3%	49.9%	52.6%	41.8%	41.3%	49.1%
Colorado	17.4%	19.7%	31.6%	30.3%	29.2%	23.1%	23.2%	23.1%	22.7%	25.6%	31.3%
Connecticut	22.9%	20.7%	25.1%	24.7%	25.7%	25.4%	25.1%	25.0%	24.7%	24.6%	24.7%
Delaware	23.9%	19.6%	12.0%	16.1%	18.2%	15.7%	18.5%	16.6%	16.3%	15.6%	23.9%
Florida	18.4%	18.2%	86.1%	9.8%	12.9%	12.6%	9.5%	10.7%	19.0%	23.1%	26.1%
Georgia	13.1%	10.9%	9.4%	16.0%	10.9%	22.2%	9.8%	11.3%	11.1%	18.4%	18.7%
Hawaii	24.7%	24.7%	16.8%	22.6%	19.5%	25.8%	34.2%	31.5%	40.5%	43.5%	67.1%
Idaho	13.3%	16.2%	15.7%	21.1%	16.2%	17.4%	17.7%	17.0%	22.0%	15.4%	16.6%
Illinois	11.2%	9.5%	11.8%	11.6%	10.3%	9.3%	10.0%	21.5%	18.1%	11.6%	12.1%
Indiana	20.1%	35.6%	37.9%	22.5%	1.5%	2.6%	4.7%	7.6%	22.7%	3.4%	5.0%
Iowa	14.7%	20.3%	13.5%	13.5%	13.1%	7.6%	8.0%	9.1%	10.1%	9.9%	8.7%
Kansas	4.3%	4.4%	5.6%	5.5%	8.6%	4.5%	3.1%	11.3%	10.9%	15.2%	16.2%
Kentucky	13.2%	13.2%	12.2%	15.9%	18.6%	16.4%	17.9%	29.9%	17.4%	17.3%	17.6%
Louisiana	19.3%	13.6%	11.1%	13.5%	13.0%	12.7%	12.2%	8.9%	11.1%	11.1%	10.0%
Maine	26.1%	25.6%	15.1%	14.1%	13.9%	12.8%	25.9%	27.8%	18.6%	21.6%	23.4%
Maryland	13.4%	28.9%	11.0%	14.2%	9.7%	9.1%	10.4%	12.0%	26.8%	12.2%	11.2%
Massachusetts	17.1%	12.6%		4.4%	29.8%	37.0%	30.9%	31.9%	19.5%		52.9%
Michigan	13.0%	12.7%	18.0%	18.0%	14.4%	12.0%	15.3%	13.3%	13.9%	12.7%	17.1%
Minnesota	29.1%	33.4%	10.0%	16.0%	16.9%	13.2%	13.9%	15.5%	13.9%	13.2%	14.0%
Mississippi	10.8%	10.1%	10.8%	13.2%	14.9%	14.9%	14.1%	13.3%	16.2%	16.2%	20.4%
Missouri	6.3%	5.7%	6.0%	4.3%	5.2%	5.1%	5.2%	5.1%	16.5%	13.1%	16.5%
Montana	24.0%	18.5%	19.2%	5.7%	4.6%	3.8%	4.2%	4.5%	8.2%	6.0%	3.7%
Nebraska		18.0%	12.1%	15.0%	12.8%	12.1%	11.1%	12.0%	16.8%	11.9%	14.0%
Nevada	23.3%	12.7%	14.1%	13.3%	14.7%	16.4%	12.8%	11.7%	17.1%	16.2%	17.1%
New Hampshire	6.2%	14.5%	23.3%	12.3%	18.5%	17.1%	13.7%	17.2%	15.1%	21.1%	23.1%
New Jersey	7.2%	7.1%	18.0%	7.4%	9.9%	9.9%	8.5%	7.2%	11.6%	21.0%	7.9%
New Mexico	3.2%	3.6%	8.0%	11.2%	10.6%	10.4%	42.1%	16.5%	17.3%	7.0%	5.8%
New York	5.3%	6.7%	9.6%	18.9%	12.4%	12.3%	13.4%	10.4%	7.3%	7.7%	7.1%
North Carolina	15.6%	17.7%	15.7%	24.3%	22.4%	23.2%	21.4%	23.2%	21.0%	21.0%	26.1%
North Dakota	15.8%	19.3%	15.6%	15.5%	13.3%	13.5%	11.8%	11.7%	10.4%	9.3%	13.0%
Ohio	3.8%	3.8%	9.7%	9.8%	10.7%	10.1%	8.0%	10.2%	9.6%	9.1%	12.7%
Oklahoma	18.2%	15.4%	12.6%	12.6%	10.5%	9.8%	9.0%	9.4%	10.3%	9.9%	11.9%
Oregon	21.9%	10.8%	14.8%	14.9%	15.9%	20.0%	19.4%	15.1%	25.0%	15.4%	22.0%
Pennsylvania	22.5%	9.8%	5.7%	7.7%	11.4%	10.1%	6.3%	6.2%	5.7%	6.0%	6.5%
Rhode Island	42.8%	42.8%	42.2%	53.5%	46.8%	51.3%	41.4%	30.3%	34.0%	28.5%	37.0%
South Carolina	16.8%	18.3%	5.1%	15.1%	24.4%	22.2%	15.8%	17.4%	15.7%	17.5%	22.7%
South Dakota	10.7%	10.3%	8.8%	9.6%	9.0%	12.5%	7.0%	7.7%	10.2%	9.0%	9.3%
Tennessee	19.9%	19.4%	19.0%	20.9%	17.9%	18.3%	20.0%	22.9%	20.5%	18.2%	19.2%
Texas	11.9%		12.0%	15.0%	16.3%	17.3%	19.6%	12.2%	15.2%	13.0%	13.4%
Utah	20.2%	22.9%	26.1%	33.8%	22.7%	19.6%	20.5%	25.1%	25.1%	20.7%	17.6%
Vermont	13.8%	14.9%	14.5%	14.9%	14.1%	14.6%	14.8%	14.8%	14.8%	22.3%	
Virginia	13.9%	17.9%	18.0%	18.5%	14.7%	16.8%	13.4%	13.9%	15.4%	18.9%	20.4%
Washington	26.3%	28.1%	21.3%	16.1%	20.6%	28.1%	28.4%	27.8%	25.3%	25.4%	22.8%
West Virginia	12.3%	5.3%	4.7%	5.2%	7.7%	6.4%	6.8%	7.1%	4.6%	9.0%	6.8%
Wisconsin	9.8%	12.8%	12.6%	15.3%	10.1%	11.2%	11.7%	12.7%	12.5%	12.4%	12.0%
Wyoming	17.1%	15.0%	16.2%	18.4%	17.5%	14.6%	15.5%	17.5%	15.7%	15.8%	19.0%

FHWA Data
Table SF-4C
Total PCE and Construction for 1979 to 1989 (000 omitted)

State	PCE	Construction	PCE as % of Constr ruction
California	2490070	5476087	45.5%
Rhode Island	223021	599096	37.2%
Alaska	311528	991994	31.4%
Hawaii	171332	551739	31.1%
Massachusetts	413432	1647269	25.1%
Colorado	428535	1726491	24.8%
Connecticut	646332	2624445	24.6%
Washington	777071	3155804	24.6%
Utah	343575	1545898	22.2%
North Carolina	665513	3158679	21.1%
Maine	142195	697894	20.4%
Tennessee	546334	2797326	19.5%
Arizona	415734	2325748	17.9%
South Carolina	303818	1721901	17.6%
Oregon	290723	1656419	17.6%
Delaware	140034	802565	17.4%
Florida	1087828	6300000	17.3%
Kentucky	604157	3523111	17.1%
Idaho	121835	715877	17.0%
Virginia	786199	4719148	16.7%
Wyoming	218013	1325056	16.5%
New Hampshire	95755	601620	15.9%
Vermont	57130	369613	15.5%
Minnesota	467016	3057378	15.3%
Nevada	160684	1061000	15.1%
Michigan	461025	3222189	14.3%
Texas	1603647	11252728	14.3%
Mississippi	270835	1930759	14.0%
Arkansas	248698	1828018	13.6%
Maryland	459896	3395588	13.5%
Georgia	660391	4907571	13.5%
Nebraska	154998	1175523	13.2%
North Dakota	87414	669153	13.1%
New Mexico	214312	1730866	12.4%
Illinois	973331	7971127	12.2%
Louisiana	511979	4255280	12.0%
Wisconsin	276578	2299167	12.0%
Oklahoma	239316	2152434	11.1%
Iowa	225376	2113924	10.7%
New Jersey	417882	4029973	10.4%
New York	808826	8365309	9.7%
South Dakota	79696	850698	9.4%
Indiana	211685	2295417	9.2%
Ohio	430847	4681327	9.2%
Kansas	168810	2017684	8.4%
Montana	108811	1306599	8.3%
Missouri	243435	2965706	8.2%
Pennsylvania	618331	8515944	7.3%
West Virginia	187552	2787737	6.7%
Alabama	178942	3097976	5.8%
50 State Average:			15.2%

FHWA Data File PR-37

Total PCE dollar reimbursement on Federally funded projects

State	1979	1980	1981	1983	1984	1985	1986	1987	1988	1989
Alabama	13.03	16.10	6.87	13.09	15.70	6.56	9.79	3.62	10.39	7.78
Alaska	7.29	7.24	7.47	3.59	6.67	11.84	16.24	7.91	5.53	5.51
Arizona	3.52	1.24	0.51	6.52	10.11	11.67	3.10	4.55	3.73	0.76
Arkansas	2.67	0.99	0.10	1.34	11.52	0.96	2.24	3.48	2.06	0.34
California	29.31	26.53	16.43	63.65	125.78	81.34	38.58	37.56	68.70	61.69
Colorado	6.67	12.74	6.77	12.69	12.12	17.61	12.63	16.71	26.83	17.00
Connecticut	5.16	12.08	57.60	18.29	11.93	4.23	8.67	4.77	12.59	7.81
Delaware	3.26	4.71	0.87	3.73	5.72	2.86	1.79	1.06	0.22	0.61
Florida	6.69	26.61	11.40	25.17	13.81	22.25	16.69	13.37	16.15	18.47
Georgia	12.16	4.69	4.86	5.57	10.28	7.90	7.49	2.02	2.16	1.69
Hawaii	3.41	1.26	16.34	55.76	6.11	2.87	3.18	2.09	1.16	0.81
Idaho	1.90	1.72	1.77	5.10	4.30	5.96	2.78	2.62	2.22	2.90
Illinois	13.02	9.78	17.68	10.88	8.94	8.53	7.48	9.92	5.05	2.59
Indiana	13.58	9.59	13.80	6.45	15.91	15.96	17.53	7.67	5.51	9.47
Iowa	3.21	4.90	1.11	7.51	0.94	3.55	3.07	6.48	2.33	3.52
Kansas	9.27	6.57	1.96	4.05	3.03	4.71	7.41	1.87	3.94	8.12
Kentucky	15.94	10.32	8.62	3.19	17.64	9.22	15.76	9.95	16.27	5.13
Louisiana	24.29	9.26	9.15	15.68	1.06	4.32	6.91	8.82	10.00	5.51
Maine	3.03	5.29	1.78	1.72	3.59	4.12	4.76	7.55	10.94	6.60
Maryland	7.44	8.48	12.62	20.80	9.23	9.84	4.48	2.46	1.30	4.12
Massachusetts	7.38	8.97	10.10	4.91	11.53	9.31	12.13	92.36	26.32	21.06
Michigan	5.40	5.83	16.58	6.15	7.46	7.61	5.71	4.11	1.62	9.98
Minnesota	6.82	3.79	5.56	7.46	14.67	3.13	17.23	1.28	8.04	1.46
Mississippi	5.73	1.57	2.28	3.34	1.05	2.01	3.12	0.61	3.16	0.46
Missouri	23.17	25.35	8.40	14.37	8.53	8.84	8.88	11.03	2.74	4.17
Montana	3.74	3.69	2.48	9.24	6.72	6.22	6.05	5.77	12.22	5.06
Nebraska	3.82	1.26	4.38	1.48	1.86	0.97	1.07	0.66	3.28	0.45
Nevada	5.42	4.37	1.56	3.06	5.43	4.91	1.31	1.73	6.71	3.72
New Hampshire	6.33	7.75	3.06	2.87	5.17	7.50	5.85	2.96	5.51	5.76
New Jersey	20.55	16.91	18.13	22.19	42.17	24.44	21.90	31.48	14.07	16.10
New Mexico	2.80	0.71	1.20	0.28	0.19	0.11	0.01	0.00	0.81	0.02
New York	52.13	24.25	32.21	56.14	70.98	42.04	54.89	41.14	42.81	52.30
North Carolina	18.50	2.01	7.78	11.57	24.11	15.67	8.06	10.52	21.09	20.38
North Dakota	2.17	2.43	2.14	2.52	2.43	2.40	3.79	2.77	2.86	3.08
Ohio	9.48	5.78	8.97	17.52	21.99	11.16	8.19	6.43	8.38	10.48
Oklahoma	0.01	2.33	0.01	0.00	12.83	2.48	0.00	1.43	12.73	1.47
Oregon	4.12	5.27	6.30	3.70	13.98	11.91	6.55	11.85	2.17	3.14
Pennsylvania	23.65	29.50	50.68	33.48	46.93	28.99	11.56	17.43	19.13	19.99
Rhode Island	2.58	3.30	16.18	8.58	8.17	4.82	3.69	8.43	0.60	4.07
South Carolina	4.65	2.45	1.27	9.58	20.55	3.25	4.62	6.89	4.58	4.87
South Dakota	1.93	2.34	0.66	1.51	1.27	1.51	1.24	2.17	2.77	1.52
Tennessee	15.73	12.35	17.85	20.08	14.46	17.52	12.39	17.48	16.52	18.97
Texas	14.10	16.76	9.62	12.80	91.31	5.16	10.76	8.78	1.22	6.99
Utah	0.66	4.62	1.57	1.80	1.88	2.87	2.41	6.04	3.93	3.72
Vermont	4.35	2.27	2.51	3.49	7.86	6.26	5.76	5.93	3.44	7.53
Virginia	7.30	7.82	3.30	10.84	14.80	12.60	2.89	6.36	2.73	0.00
Washington	42.35	26.75	13.83	68.56	26.00	16.60	22.10	41.45	8.70	41.52
West Virginia	2.88	8.96	7.77	7.65	18.55	13.06	17.89	11.77	12.37	6.29
Wisconsin	7.99	6.30	14.35	8.97	21.12	15.98	38.92	29.58	19.45	3.86
Wyoming	0.86	0.82	0.10	2.24	1.15	0.72	0.43	0.20	2.32	2.66

FHWA Data File PR-37
Total PCE dollar reimbursement on Federally funded projects
Dollars contracted out

State	1979	1980	1981	1983	1984	1985	1986	1987	1988	1989
Alabama	0.41	0.99	0.59	0.00	3.06	0.25	0.71	0.30	0.20	0.12
Alaska	1.24	1.32	0.94	0.10	0.00	1.22	1.85	1.09	0.84	1.03
Arizona	1.89	0.03	0.35	5.44	4.40	10.56	1.58	2.38	2.63	0.28
Arkansas	1.48	0.22	0.00	0.13	0.76	0.36	1.99	0.49	0.12	0.00
California	0.17	0.27	0.00	0.09	0.11	0.00	0.00	0.04	0.00	0.00
Colorado	0.01	0.11	0.00	0.08	0.52	0.00	3.11	3.20	8.17	4.80
Connecticut	0.20	9.21	13.24	13.25	0.35	0.50	0.00	1.29	5.89	1.85
Delaware	1.88	3.30	0.39	1.86	3.38	1.96	0.81	0.52	0.10	0.03
Florida	1.50	15.63	3.48	14.87	8.83	16.55	8.58	10.51	13.47	16.06
Georgia	0.00	0.00	0.11	0.27	1.69	3.61	3.86	0.49	1.29	0.58
Hawaii	0.08	0.51	15.14	50.30	1.62	0.85	1.36	0.76	0.66	0.37
Idaho	0.83	0.65	0.44	1.45	1.94	4.13	1.34	0.95	0.30	1.62
Illinois	10.06	7.67	11.48	8.54	7.43	6.12	5.18	8.26	3.30	2.17
Indiana	5.06	5.34	8.26	4.99	11.77	12.54	14.77	7.05	4.90	8.88
Iowa	2.25	2.34	0.39	1.88	0.04	2.37	2.36	5.58	1.85	3.09
Kansas	1.68	3.39	0.46	0.00	0.15	0.83	0.78	0.12	0.36	0.35
Kentucky	4.38	1.87	0.63	0.46	0.10	0.24	0.99	1.86	6.98	0.53
Louisiana	24.23	9.21	9.13	15.64	1.06	4.32	5.41	8.17	9.45	5.46
Maine	0.00	0.33	0.10	0.00	0.00	0.00	0.50	0.19	0.18	0.28
Maryland	3.34	5.13	2.06	16.12	3.06	3.45	4.16	2.27	0.84	2.49
Massachusetts	4.75	6.74	6.08	4.91	11.13	9.31	11.26	89.35	7.42	20.80
Michigan	0.03	0.19	0.51	0.00	0.14	0.35	0.86	0.44	0.00	0.00
Minnesota	4.76	1.90	2.65	1.07	8.68	0.44	3.19	0.79	2.99	0.46
Mississippi	0.12	0.57	0.00	0.00	0.00	0.00	0.28	0.05	1.08	0.01
Missouri	3.69	0.34	0.38	0.66	0.12	4.37	7.99	6.16	1.86	2.82
Montana	0.51	0.88	0.19	0.10	0.44	0.24	0.02	0.00	0.26	0.00
Nebraska	2.41	0.30	1.42	0.13	0.76	0.14	0.48	0.41	2.30	0.38
Nevada	1.30	0.95	0.62	0.41	2.11	1.01	0.13	0.17	2.96	1.84
New Hampshire	3.98	6.12	1.68	0.19	6.67	4.16	0.68	0.72	2.81	0.74
New Jersey	12.24	9.23	10.93	13.87	27.75	14.61	14.40	19.88	9.40	11.02
New Mexico	1.25	0.17	0.27	0.14	0.15	0.00	0.00	0.00	0.00	0.00
New York	33.34	15.93	19.17	31.64	42.11	28.67	41.76	25.59	29.66	38.49
North Carolina	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.02	8.51	10.30
North Dakota	0.04	0.16	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Ohio	7.02	2.87	3.49	13.28	16.71	8.52	5.19	3.74	5.28	4.79
Oklahoma	0.00	0.00	0.00	0.00	12.80	2.48	0.00	1.29	12.54	1.33
Oregon	0.10	0.03	0.04	0.00	0.00	0.00	0.46	0.91	0.26	0.45
Pennsylvania	10.18	13.35	27.33	22.75	29.91	19.77	8.31	13.06	13.04	15.83
Rhode Island	1.52	2.70	14.67	0.15	6.87	2.23	2.42	7.20	0.55	3.85
South Carolina	1.27	0.58	0.15	7.53	16.31	0.98	2.95	3.89	2.84	3.00
South Dakota	0.05	0.31	0.08	0.62	0.33	0.11	0.49	0.49	1.63	0.74
Tennessee	8.42	7.37	4.51	3.04	2.94	1.25	3.09	4.62	5.96	5.03
Texas	0.01	0.00	0.02	0.03	6.60	1.57	0.59	7.61	0.39	4.23
Utah	0.00	0.00	0.01	0.01	0.00	0.00	0.02	3.23	3.06	1.19
Vermont	0.00	0.00	0.00	0.00	0.07	0.00	0.54	0.31	0.38	3.51
Virginia	0.00	0.14	0.01	0.29	1.00	1.48	0.51	0.02	0.35	0.00
Washington	0.13	4.14	0.23	1.23	0.50	3.89	9.54	19.08	3.49	1.89
West Virginia	2.14	6.76	4.91	2.22	8.75	5.91	7.42	3.73	3.44	1.00
Wisconsin	0.72	0.79	1.69	1.86	4.25	3.03	1.90	6.52	5.32	1.28
Wyoming	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.06	0.21	0.32

FHWA Data File PR-37
Percentage Contracted Out

State	1979	1980	1981	1983	1984	1985	1986	1987	1988	1989
Alabama	3.1%	6.1%	8.6%	0.0%	19.5%	3.8%	7.3%	8.3%	1.9%	1.5%
Alaska	17.0%	18.2%	12.6%	2.8%	0.0%	10.3%	11.4%	13.8%	15.2%	18.7%
Arizona	53.7%	2.4%	68.6%	83.4%	43.5%	90.5%	51.0%	52.3%	70.5%	36.8%
Arkansas	55.4%	22.2%	0.0%	9.7%	6.6%	37.5%	88.8%	14.1%	5.8%	0.0%
California	0.6%	1.0%	0.0%	0.1%	0.1%	0.0%	0.0%	0.1%	0.0%	0.0%
Colorado	0.1%	0.9%	0.0%	0.6%	4.3%	0.0%	24.6%	19.2%	30.5%	28.2%
Connecticut	3.9%	76.2%	23.0%	72.4%	2.9%	11.8%	0.0%	27.0%	46.8%	23.7%
Delaware	57.7%	70.1%	44.8%	49.9%	59.1%	68.5%	45.3%	49.1%	45.5%	4.9%
Florida	22.4%	58.7%	30.5%	59.1%	63.9%	74.4%	51.4%	78.6%	83.4%	87.0%
Georgia	0.0%	0.0%	2.3%	4.8%	16.4%	45.7%	51.5%	24.3%	59.7%	34.3%
Hawaii	2.3%	40.5%	92.7%	90.2%	26.5%	29.6%	42.8%	36.4%	56.9%	45.7%
Idaho	43.7%	37.8%	24.9%	28.4%	45.1%	69.3%	48.2%	36.3%	13.5%	55.9%
Illinois	77.3%	78.4%	64.9%	78.5%	83.1%	71.7%	69.3%	83.3%	65.3%	83.8%
Indiana	37.3%	55.7%	59.9%	77.4%	74.0%	78.6%	84.3%	91.9%	88.9%	93.8%
Iowa	70.1%	47.8%	35.1%	25.0%	4.3%	66.8%	76.9%	86.1%	79.4%	87.8%
Kansas	18.1%	51.6%	23.5%	0.0%	5.0%	17.6%	10.5%	6.4%	9.1%	4.3%
Kentucky	27.5%	18.1%	7.3%	14.4%	0.6%	2.6%	6.3%	18.7%	42.9%	10.3%
Louisiana	99.8%	99.5%	99.8%	99.7%	100.0%	100.0%	78.3%	92.6%	94.5%	99.1%
Maine	0.0%	6.2%	5.6%	0.0%	0.0%	0.0%	10.5%	2.5%	1.6%	4.2%
Maryland	44.9%	60.5%	16.3%	77.5%	33.2%	35.1%	92.9%	92.3%	64.6%	60.4%
Massachusetts	64.4%	75.1%	60.2%	100.0%	96.5%	100.0%	92.8%	96.7%	28.2%	98.8%
Michigan	0.6%	3.3%	3.1%	0.0%	1.9%	4.6%	15.1%	10.7%	0.0%	0.0%
Minnesota	69.8%	50.1%	47.7%	14.3%	59.2%	14.1%	18.5%	61.7%	37.2%	31.5%
Mississippi	2.1%	36.3%	0.0%	0.0%	0.0%	0.0%	9.0%	8.2%	34.2%	2.2%
Missouri	15.9%	1.3%	4.5%	4.6%	1.4%	49.4%	90.0%	55.8%	67.9%	67.6%
Montana	13.6%	23.8%	7.7%	1.1%	6.5%	3.9%	0.3%	0.0%	2.1%	0.0%
Nebraska	63.1%	23.8%	32.4%	8.8%	40.9%	14.4%	44.9%	62.1%	70.1%	84.4%
Nevada	24.0%	21.7%	39.7%	13.4%	38.9%	20.6%	9.9%	9.8%	44.1%	49.5%
New Hampshire	62.9%	79.0%	54.9%	6.6%	129.0%	55.5%	11.6%	24.3%	51.0%	12.8%
New Jersey	59.6%	54.6%	60.3%	62.5%	65.8%	59.8%	65.8%	63.2%	66.8%	68.4%
New Mexico	44.6%	23.9%	22.5%	50.0%	78.9%	0.0%	0.0%		0.0%	0.0%
New York	64.0%	65.7%	59.5%	56.4%	59.3%	68.2%	76.1%	62.2%	69.3%	73.6%
North Carolina	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	57.2%	40.4%	50.5%
North Dakota	1.8%	6.6%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ohio	74.1%	49.7%	38.9%	75.8%	76.0%	76.3%	63.4%	58.2%	63.0%	45.7%
Oklahoma	0.0%	0.0%	0.0%		99.8%	100.0%		90.2%	98.5%	90.5%
Oregon	2.4%	0.6%	0.6%	0.0%	0.0%	0.0%	7.0%	7.7%	12.0%	14.3%
Pennsylvania	43.0%	45.3%	53.9%	68.0%	63.7%	68.2%	71.9%	74.9%	68.2%	79.2%
Rhode Island	58.9%	81.8%	90.7%	1.7%	84.1%	46.3%	65.6%	85.4%	91.7%	94.6%
South Carolina	27.3%	23.7%	11.8%	78.6%	79.4%	30.2%	63.9%	56.5%	62.0%	61.6%
South Dakota	2.6%	13.2%	12.1%	41.1%	26.0%	7.3%	39.5%	22.6%	58.8%	48.7%
Tennessee	53.5%	59.7%	25.3%	15.1%	20.3%	7.1%	24.9%	26.4%	36.1%	26.5%
Texas	0.1%	0.0%	0.2%	0.2%	7.2%	30.4%	5.5%	86.7%	32.0%	60.5%
Utah	0.0%	0.0%	0.6%	0.6%	0.0%	0.0%	0.8%	53.5%	77.9%	32.0%
Vermont	0.0%	0.0%	0.0%	0.0%	0.9%	0.0%	9.4%	5.2%	11.0%	46.6%
Virginia	0.0%	1.8%	0.3%	2.7%	6.8%	11.7%	17.6%	0.3%	12.8%	
Washington	0.3%	15.5%	1.7%	1.8%	1.9%	23.4%	43.2%	46.0%	40.1%	4.6%
West Virginia	74.3%	75.4%	63.2%	29.0%	47.2%	45.3%	41.5%	31.7%	27.8%	15.9%
Wisconsin	9.0%	12.5%	11.8%	20.7%	20.1%	19.0%	4.9%	22.0%	27.4%	33.2%
Wyoming	0.0%	0.0%	0.0%	0.0%	0.9%	0.0%	0.0%	30.0%	9.1%	12.0%

FHWA PR-37 File
State Averages Contracting Out

State	Overall Average	Average 79-82	Average 87-89	Change 82-89	Survey Response*
Alabama	6.0%	4.5%	3.9%	-0.6%	6.0%
Alaska	12.0%	12.7%	15.9%	3.2%	12.0%
Arizona	55.3%	52.0%	53.2%	1.2%	70.0%
Arkansas	24.0%	21.8%	6.6%	-15.2%	24.0%
California	0.2%	0.4%	0.0%	-0.4%	10.0%
Colorado	10.8%	0.4%	25.9%	25.5%	10.8%
Connecticut	28.8%	43.9%	32.5%	-11.4%	28.8%
Delaware	49.5%	55.6%	33.1%	-22.5%	49.5%
Florida	60.9%	42.7%	83.0%	40.3%	60.9%
Georgia	23.9%	1.8%	39.4%	37.7%	5.0%
Hawaii	46.4%	56.4%	46.3%	-10.1%	80.0%
Idaho	40.3%	33.7%	35.2%	1.5%	40.3%
Illinois	75.6%	74.8%	77.5%	2.7%	75.6%
Indiana	74.2%	57.5%	91.5%	34.0%	60.0%
Iowa	57.9%	44.5%	84.4%	39.9%	30.0%
Kansas	14.6%	23.3%	6.6%	-16.7%	50.0%
Kentucky	14.9%	16.8%	24.0%	7.1%	8.8%
Louisiana	96.3%	99.7%	95.4%	-4.3%	80.0%
Maine	3.1%	3.0%	2.8%	-0.2%	10.0%
Maryland	57.8%	49.8%	72.4%	22.6%	57.8%
Massachusetts	81.3%	74.9%	74.6%	-0.4%	60.0%
Michigan	3.9%	1.7%	3.6%	1.8%	40.0%
Minnesota	40.4%	45.5%	43.5%	-2.0%	25.0%
Mississippi	9.2%	9.6%	14.8%	5.2%	9.2%
Missouri	35.9%	6.6%	63.8%	57.2%	35.9%
Montana	5.9%	11.6%	0.7%	-10.8%	5.9%
Nebraska	44.5%	32.0%	72.2%	40.2%	10.0%
Nevada	27.2%	24.7%	34.5%	9.8%	27.2%
New Hampshire	48.8%	50.8%	29.4%	-21.5%	80.0%
New Jersey	62.7%	59.2%	66.1%	6.9%	80.0%
New Mexico	24.4%	35.3%	0.0%	-35.3%	10.0%
New York	65.4%	61.4%	68.4%	7.0%	65.4%
North Carolina	14.8%	0.0%	49.4%	49.4%	25.0%
North Dakota	0.9%	2.2%	0.0%	-2.2%	10.0%
Ohio	62.1%	59.6%	55.6%	-4.0%	62.1%
Oklahoma	59.9%	0.0%	93.1%	93.1%	59.9%
Oregon	4.5%	0.9%	11.3%	10.4%	4.5%
Pennsylvania	63.6%	52.5%	74.1%	21.6%	63.6%
Rhode Island	70.1%	58.3%	90.6%	32.3%	85.0%
South Carolina	49.5%	35.3%	60.0%	24.7%	20.0%
South Dakota	27.2%	17.3%	43.4%	26.1%	27.2%
Tennessee	29.5%	38.4%	29.7%	-8.7%	29.5%
Texas	22.3%	0.1%	59.7%	59.6%	22.3%
Utah	16.5%	0.3%	54.4%	54.1%	25.0%
Vermont	7.3%	0.0%	21.0%	21.0%	7.3%
Virginia	6.0%	1.2%	6.6%	5.4%	20.0%
Washington	17.8%	4.8%	30.2%	25.4%	17.8%
West Virginia	45.1%	60.5%	25.1%	-35.4%	45.1%
Wisconsin	18.1%	13.5%	27.5%	14.0%	40.0%
Wyoming	5.2%	0.0%	17.0%	17.0%	10.0%

**-All fifty states were contacted during March of 1991 for this study and thus represent 1990 contracting out values. States that indicated their overall contracting out was equivalent to PR-37 file data were unchanged. Values for contracting out as reported by states were tested to the 87-89 PCE data as it is felt the less exacting standard of calculating out volumes would not be accurate for periods prior to 1987.*

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