Memo discussed at 3/21/12 meeting and voted on as approved and sent to StarTran Advisory Board.

City of Lincoln

Memo

To: StarTran Advisory Board

From: Michael Justus, Chair of Audit Advisory Board

Date: 3/22/2012

Re: Final Audit Report on StarTran

As we are sure you are aware, the Final Report on StarTran from SRF Consulting Group Inc. was issued March 5, 2012. The management of StarTran has 30 days to provide responses to the report.

Although not required, the City of Lincoln Audit Advisory Board respectfully requests any input or comment the StarTran Advisory Board would like to have us consider as we develop the transmittal letter and our cover report to the City Council and Mayor. We would appreciate your response no later than April 9th, 2012.

The original RFP is attached for your consideration.

REQUEST FOR PROPOSALS
CONSULTING SERVICES
FOR
FINANCIAL, MARKETING, MANAGEMENT AND OPERATIONAL ANALYSIS
OF
CITY'S BUS SERVICES KNOWN AS STAR TRAN

1. INTENT

1.1 The City of Lincoln is soliciting proposals from qualified firms and intends to retain a professional firm to perform the following comprehensive and detailed analysis regarding the City transit system: Performance Analysis, Marketing Research, Current Management and Operational Review, and Review the options for implementing a Transit Authority or other municipal transportation models.

1.2 The major objective of this RFP is to:

1.2.1 Reduce the amount of funding provided to StarTran by the City.

1.3 This Request for Proposals will be used to select a firm based on qualifications, recommended study approach and practical applications which will accomplish the objectives of the Analysis while incorporating innovative and cost effective methods.

1.4 Any other or future additional services would be negotiated at a future date and at the sole discretion of the City.

1.5 All inquiries in regard to this RFP are to be directed, in writing, to the individual listed below:

Vince M. Mejer, Purchasing Agent
City of Lincoln Purchasing Division
"K" Street Complex, Suite 200 (SW Wing)
Lincoln, NE 68508
FAX 402-441-6513
Email vmejer@lincoln.ne.gov

1.5.1 These inquiries and/or responses shall be distributed to prospective bidders as an electronic addendum.

1.5.2 All addendums will be issued electronically via the City e-bid system.

1.5.3 The City shall only reply to written inquiries received prior to five (5) calendar days of proposal opening.

1.6 Proposers must submit an electronic response using the City E-bid System and a written response prior to the RFP closing date and time.

1.6.1 Written response must be mailed or hand-delivered to the City Purchasing Office at the following address:

Vince M. Mejer, Purchasing Agent
City of Lincoln Purchasing Division
"K" Street Complex, Suite 200 (SW Wing)
Lincoln, NE 68508

1.6.2 Failure to complete either the written or the electronic portion of the Proposal may result in the rejection of proposal.

2. GENERAL BACKGROUND

2.1 MISSION

2.1.1 StarTran's mission is to assure that Lincoln's transportation goals are met and that the greatest number of citizens are served by the StarTran system at the least possible cost.

2.2 STATEMENT OF VALUES

2.2.1 The StarTran Division prides itself in being a highly dedicated, knowledgeable and talented team known for its honesty and flexibility.

2.2.2 StarTran will continue to efficiently serve the public with the highest standards of quality, safety, and responsiveness while working with great commitment to increase the public trust and the community's quality of life.

2.3 STARTRAN SYSTEM FACTS

2.3.1 StarTran is the only mass transit carrier in the City of Lincoln.

2.3.2 StarTran is fully owned and operated by the City as a municipal service through the administration of the Lincoln Public Works & Utilities Department.

2.3.3 Service Hours
Weekdays . . . . . 5:15 a.m. - 7:10 p.m.
Saturdays . . . . . 5:55 a.m. - 7:10 p.m.
No Sunday Service

2.3.4 Annual Ridership 2009-2010
Fixed Route 1,753,777
Special Transportation Svcs 55,769
TOTAL 1,809,546

2.3.5 Annual Revenue Miles Traveled 2009-2010
Fixed Route 1,433,533
Special Transportation Svcs . . .. .335,918
TOTAL 1,769,451

2.3.6 Funding Sources Budgeted 2010-2011
Operating
Federal $2,457,670
State $ 300,000
City $5,330,123
Users Fee $1,577,022

2.3.7 Annual Operating Budget 2010-2011
$9,664,815

2.3.8 Fleet

2.3.8.1 Full Size Coaches
1997 Gillig 11
2001 Gillig 20
2004 Gillig 10
2006 Gillig 15
2010 Glaval 3
Total 59

2.3.8.2 HandiVans:
2008 Uplander 1
2010 Glaval 10
Total 11

2.3.8.3 Bus Routes - (All Accessible)
Regular Line Service - 16
Downtown Circulator - 1

2.3.8.4 Special Transportation Services Include:
HandiVan/Brokerage Service

2.3.9 StarTran Advisory Board

2.3.9.1 The StarTran Advisory Board exists to advise the Mayor, City Council and Director of Public Works concerning operation of StarTran (except general personnel matters).

2.4 SPECIAL PROGRAMS

2.4.1 "Big Red Express" Husker Football Shuttle: Big Red Express service begins two hours prior to kick-off with continuous shuttle service to the east stadium. Last buses will leave these lots to the stadium approximately 45 minutes prior to kick-off. Buses will return to the lots immediately after the game.

2.4.2 Bike and Bus

2.4.3 Handi-Van Program: door-to-door transportation service created to help meet the transportation needs of individuals who experience disability and who, because of that disability, are unable to ride the regular fixed-routed city bus.

2.4.4 Ride for $7.50 - Low-Income Bus Pass Program: If you are low-income, you can purchase a StarTran 31-Day Pass for only $7.50 ($15 for HandiVan-eligible patrons)

2.4.5 Star Pass - Summer Youth Bus Pass: The "Star Pass" is for youth ages 5-18, valid from June 1-August 31, 2010. This pass offers unlimited rides on StarTran buses and special discounts from nineteen participation sponsors all summer long.

2.4.6 Stuff the Bus: StarTran, in cooperation with North Wal-Mart, South Wal-Mart, East Wal-Mart, Sam's and Three Eagles Communications, is sponsoring a "Stuff the Bus" promotion for the donation of new items needed by women and children at Friendship Home.

2.4.7 FTE's
75 Bus Operators
35.28 other Employees in various classifications
2.10 Employees paid out of Grant-in-aid fund

2.4.8 Operates buses between University of Nebraska campuses.

3. GENERAL REQUIREMENTS AND SERVICES

3.1 The following describes the general extent of services to be provided by the selected firm.

3.1.1 The information presented is not necessarily all-inclusive and the selected firm shall include in their proposal any tasks and services deemed necessary to satisfactorily complete the project.

3.1.2 City will rely on the firm's competence and experience to develop a final scope of services identifying all necessary tasks, meetings, and deliverables.

3.2 BASIC OVERALL STUDY SERVICES

3.2.1 Initially meet with City Designee, to review the scope of required services, study criteria and expectations, obtain background information and establish tentative schedule for completion.

3.2.2 Conduct necessary visits and site investigations review existing background information and review related data.

3.2.2.1 Cooperate with other City and private contractors and service providers as necessary while performing work on this project.

3.2.3 Prepare and present final detailed report to City Designee Team, Mayor, City Council and other interest groups as outlined and described in this RFP and the firm's final scope of services.

3.2.4 Submit ten (10) printed copies of Final Study Report and one (1) electronic copy in acceptable electronic formats (MS Word and Adobe Acrobat.pdf files) to the City Designee.

4. **PERFORMANCE ANALYSIS REQUIREMENTS**

4.1 Financial Efficiency Review, including but are not limited to:

4.1.1 Identify areas within StarTran (Operations and Management) that are financially inefficient.

4.1.2 Identify cost savings with time management changes, operation changes, route changes, or equipment changes.

4.1.3 Identify ways to provide existing services at less cost.

4.1.4 Make recommendations regarding StarTran's rate structure.

4.1.5 Present any alternate revenue funding sources.

5. **MARKETING RESEARCH ANALYSIS:**

5.1 Review the StarTran and StarTran Advisory Board's Marketing Research Plan. (See attached PDF)

5.2 Determine efficiency and effectiveness of the current marketing efforts and make suggestions for improvement.

6. **DETERMINE IF STARTRAN IS SERVING ITS CLIENTS EFFECTIVELY AND EFFICENTLY**

6.1 Review StarTran's client data and give suggestions for improvements on its collection and StarTran's use of the information.

7. **REVIEW STARTRAN'S CURRENT MANAGEMENT AND OPERATION STRUCTURE**

7.1 Make recommendations on how to improve efficiency of the management and operational structure.

8. **REVIEW THE OPTION OF IMPLEMENTING AN APPROPRIATE TRANSIT AUTHORITY MODEL**

8.1 Provide the strengths, weaknesses, cost, groups affected, and funding of any changes.

9. **CONSIDERATIONS IN MAKING STARTRAN FULLY OR PARTIALLY PRIVATE (WITH A CITY SUBSIDY)**

10. **ADDITIONAL EVALUATION REQUIREMENTS**

10.1 Following is a list of recommendations that have been provided to us. Review and comment on each of these recommendations in addition to any other recommendations that may be presented. (Provide the strengths, weaknesses, cost, groups affected, and funding.)

10.1.1 Lower sales commission on bus wraps by working with local media sales to generate more revenue.

10.1.2 Outsource all StarTran's Marketing (save $25,000 by eliminating marketing position at StarTran).

10.1.3 Reduce Saturday Service during off peak hours.

10.1.4 Reset bus fares. (Consider free fares, 25¢ fares, and $1.00 fares)

10.1.5 Evaluate Administrative Staff Cuts.

10.1.6 Evaluate the elimination of one bus route. (The South Pointe route could possibly save $150,000).

10.1.7 Don't provide bus service to new development areas to save money.

11. CITY'S RESPONSIBILITIES

11.1 Assign City contacts to coordinate work activities of the City designated team, Consultant, and other affected City Departments.

11.2 Provide pertinent data for use by interested firms including a link to the August 2007 Transit Development Plan. http://lincoln.ne.gov/city/plan/transit/finalrpt/index.htm

11.3 Provide all policy and budgetary decisions so as to allow timely completion of the work.

11.4 Supply pertinent existing records, and other available information.

11.5 Provide the contractor with copies of section 4.66 of the Lincoln Municipal Code (LMC) that sets out the duties and responsibilities of the City Audit Advisory Board. http://lincoln.ne.gov/city/attorn/lmc/ti04/ch466.pdf

11.6 Provide copies of the Lincoln Municipal Code Section 2.38, which sets out the duties of StarTran. http://lincoln.ne.gov/city/attorn/lmc/ti02/ch238.pdf

12. TENTATIVE PROJECT SCHEDULE

12.1	Advertise Proposals	April 29, 2011
12.2	Receive Proposals	June 6, 2011
12.3	Review Proposals	June 8-15, 2011
12.4	Interview and Select Firms	June 27-30, 2011
12.5	Finalize Contract	July 20, 2011
12.6	Begin Study Work	August 1, 2011
12.7	Complete and Submit Draft Study	Please include in your response
12.8	Present Final Study & Report	Please include in your response

13. PROPOSAL CONTENTS

13.1 Describe and outline the timeline and key work elements of the **Firm's Approach** to performing the work required by this project.

13.1.1 Include implementation plan describing project phases, key work elements to meet critical project dates, and a recommended schedule of meetings to provide for timely input by City Designee team.

13.2 Outline the **Proposed Project Schedule** to meet the project schedules previously outlined in the RFP.

13.2.1 Provisions for meaningful input from City Designee team during the initial and final phases of the study, and of various portions of the project are essential and shall be addressed.

13.3 Delineate the **Project Team and Organization** for this project.

13.3.1 Include names of key individuals to be assigned to, and work directly on, the project.

13.3.2 Describe specific areas and limits of responsibilities for each of the team members and proposed sub-consultants to be utilized.

13.3.3 Include a project team organizational chart showing lines of responsibility and extent of involvement for sub-consultants. Include resumes for project team members, key individuals, and sub-consultants.

13.4 Describe the **Ability of the Firm to Meet the Intent of Required Services** Outlined in this RFP, including:

13.4.1 Time availability of team members to meet the tentative project schedule.

13.4.2 Quality Assurance and Quality Control (QA/QC) review procedures to be utilized on this project.

13.4.3 Cost estimating and cost control procedures used by firm on similar projects.

13.4.4 A statement of general qualifications and background experience of the firm and project team members, including sub-consultants in this type of project and work.

13.4.5 In addition to information provided in response to RFP provide further detailed statement of general qualification and background experience of the firm and project team members, including sub-consultants proposed for this type of project and work.

13.4.5.1 Include a report comparable to similar projects similar size, capacity and cost.

13.4.6 Listing of types of anticipated assistance that may be required from Owner.

13.4.7 Submit four contacts of former clients (to include contact person, title, and telephone number) for which your firm was engaged within the past five (5) years to perform similar financial analysis, cost of service and rate studies.

13.4.8 Proposals shall be provided on plain white paper; limited to 25 pages in length; and, stapled in the upper left corner. This does not include cover letter and resumes.

14. EVALUATION CRITERIA

14.1 Understanding of the requirements of this project.

14.2 Relevance and suitability of the project approach and schedule to meet the needs of the City.

14.3 Qualifications and expertise of the key personnel to be assigned to this project.

14.4 Background experience of the firm and the project team as it directly relates to this project.

14.5 Record of past performance on similar projects.

14.6 Comments and opinions provided by references.

14.7 Quality and cost control procedures to be used on this project. Identify personnel responsible for these controls.

14.8 Resources of the firm to conduct and complete this project in a satisfactory manner Factors to be considered include: current work load (including current work with the City); schedule for completion; and, ability and willingness to commit the key personnel to complete the projects by the scheduled dates outlined in this RFP.

14.9 Clarity, conciseness, completeness, and organization of proposal.

14.10 Proposals will be reviewed, evaluated and short listed/ranked (e.g.: 1, 2, 3) in accordance with the City's selection process and procedure.

14.11 The top ranked firm will be invited to scoping and contract negotiation meetings.

14.12 Fees will be part of evaluation.

15. SUBMITTAL PROCEDURES

15.1 Submit five (5) copies (one (1) original and four (4) copies) of your proposal to Vince M. Mejer, Purchasing Agent, City of Lincoln, 440 South 8th Street, Suite 200, Lincoln, Nebraska, 68508, **no later than the date and time stated in this Request for Proposals.**

15.2 Mark the outside of the container with the name of the project. Proposal must be submitted in a sealed envelope or container.

16. ESTIMATED FEES

16.1 The City will rank the proposals based on the criteria outlined in the RFP and determine a short list.

16.2 The firms shall submit a detail scope with a proposed fee structure for negotiation, to include hourly rates.

16.2.1 Fees shall be submitted in a separate envelope and included with your proposal.

16.3 If the City is unable to arrive at a mutual agreement with the top ranked firm, the City retains the sole right to move on to negotiations with the second (then third, etc.) ranked firm.

17. INSURANCE

17.1 Successful firm shall obtain all insurance required and approved by the City Attorney for the City of Lincoln. Standard Certificate of Insurance requirements can be found on the City website at:
www.lincoln.ne.gov/city/finance/purch/index.htm

17.2 All certificates of insurance shall be filed with the City of Lincoln on the standard Accord Certificate Of Insurance form showing the specific limits of insurance coverage required in Sections A, B, C, D, and showing the City of Lincoln as named additional insured.

17.2.1 Such certificate shall specifically state that insurance policies are to be endorsed to require the insurer to provide the City of Lincoln thirty days notice of cancellation, non-renewal or any material reduction of insurance coverage.

17.3 Successful firm shall use the standard City of Lincoln contract form and language found on the City Attorney's website at:
www.lincoln.ne.gov/city/attorn/contract/contents.htm

Advertise X time
Wednesday, XXXXXX, 2011

City of Lincoln/Lancaster County
Purchasing Division
REQUEST FOR PROPOSALS

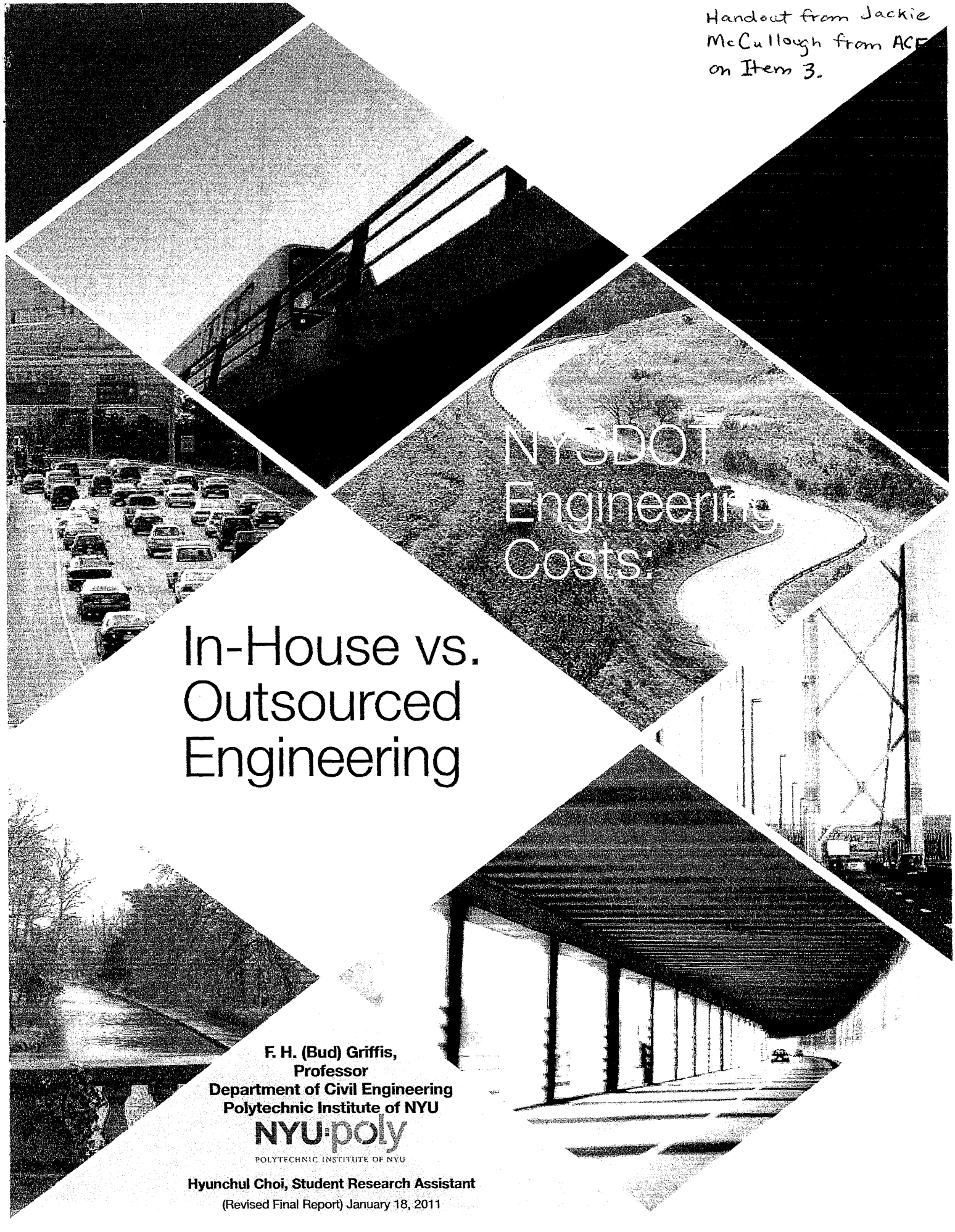
Sealed proposals will be received by the Purchasing Agent of the City of Lincoln/Lancaster County, Nebraska **BY ELECTRONIC PROCESS** until: **12:00 pm, XXXXX, XXXXX, 2011** for providing the following:

CONSULTING SERVICES
FOR
FINANCIAL, MARKETING, MANAGEMENT AND OPERATIONAL ANALYSIS OF CITY'S BUS SERVICES KNOWN AS STAR TRAN
Bid No. 11-XXX

Submitters must be registered on the City/County's E-Bid site in order to respond to the above request. To Register go to: lincoln.ne.gov (type: e-bid - in search box, then click "Supplier Registration")

Upon e-mail notification of registration approval, you may go to the E-Bid site to respond to this bid. Questions concerning this bid process may be directed to City/County Purchasing at (402) 441-8313 or (402) 441-7410 or *vmejer@lincoln.ne.gov*

Handout from Jackie McCullough from ACE on Item 3.



NYSDOT Engineering Costs:

In-House vs. Outsourced Engineering

F. H. (Bud) Griffis,
Professor
Department of Civil Engineering
Polytechnic Institute of NYU

NYU·poly
POLYTECHNIC INSTITUTE OF NYU

Hyunchul Choi, Student Research Assistant

(Revised Final Report) January 18, 2011

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I. Executive Summary

This study objectively analyzes and compares the cost of having public-sector design work performed in-house with contracting out that same work to private engineering consulting companies.

The percentage of work performed by NY State in-house versus that which is contracted out varies among New York State agencies and authorities. Many agencies target a design work load of 25% in-house and 75% contracted out to accomplish their programs and in-house training goals. This guideline was used by the U.S. Army Corps of Engineers, New York District from 1983 to 1986 and is currently practiced by the New York State Thruway Authority. New York State Department of Transportation (NYSDOT) has traditionally reported that it performs 50% or more of its work with in-house forces, although in some regions the in-house design percentage is as high as approximately 80%. As we believe this to be a very high percentage of in-house work when compared with other NYS agencies and authorities, we have chosen to focus this comparison of cost effectiveness on transportation projects and the NYS-DOT. While a few studies have been conducted in the past, these studies were primarily based on subjective analysis using extremely limited data, if any.

It might be anticipated that the cost of an engineer would be the same whether he or she is in the public or private sector; however this study found that because of the generous benefits package provided by the State of New York, the large amount of paid time off, and a reduced work week compared to the private sector, the in-house engineer actual expected cost to the tax payer exceeds the cost of a private engineer by at least 15%. These calculations are based on conservative assumptions and the actual difference considerably exceeds 15%. The total cost of a career NYSDOT employee to taxpayers is in excess of $ 6.4 million over a 30 year career.

The cost of the pension system in the state has risen from $1 billion in 2000 to about $7.5 billion in 2006. Based on our assumptions, the state has understated its contributions to the retirement system by about 5.5%. In our calculations we used a state contribution as reported by the NYSDOT of 10.17% and an employee contribution of 3.0%. To cover the cost of an individual retirement plan, a total contribution of 18.6% is required. Were this to be included in the calculations in this report, an additional $3,924 could be added to a NYSDOT employee's expected annual salary.

We also performed a stochastic simulation to allow variations in assumptions. Based on these simulations, we have a 90% assurance that the annual cost to the tax payer of a typical NYSDOT engineer will be between $207,112 and $232,251. Our analysis indicated that the average annual cost to the taxpayer of a private sector consultant engineer is approximately $186,142. As shown by this analysis, even the lower value of this NYSDOT range is still greater than the expected cost to the taxpayer of a private consulting engineer.

In addition to cost, it is beneficial for the public sector to outsource engineering services for the following reasons:

1. ***Decisions based on policy.*** The government is not meant to perform functions that private organizations can perform equally well. Government design and construction agencies should be leaders in a public-private partnership team.
2. ***Decision based on staffing capacity.*** The public cannot afford to staff an agency to handle peak workloads. If the DOT staffed up to handle peak workloads, it is liable to pay those employees in lean times even if they have nothing to work on. If a project is outsourced, consultant employees are only paid for the time they work on the project and they leave a project once it is over.
3. ***Decision based on schedule constraints.*** This issue is based on capacity, expertise, and attitude and must be addressed to complete critical projects on time. Consultants have more flexibility to meet fast-track deadlines than government agencies.
4. ***Decision based on lack of special expertise.*** Often the DOT has no choice but to outsource the design if it lacks the required expertise in-house.
5. ***Decision based on the need for innovation.*** The private sector has more means to encourage innovation than government agencies, including bonus programs and the sharing of intellectual properties. Most government agencies cannot by regulation provide those types of incentives.
6. ***Decision based on better management of risks.*** A contract is a risk management tool that enables certain risks to be shifted to the consultant who has control over the design.
7. ***Decision based on improving quality.*** Since consultants compete against one another for work, they cannot submit a poor-quality design and expect to be selected again by the same agency. Past performance is a major gate-keeper in the selection of consultants.
8. ***Decision based on cost effectiveness.*** Even though the cost of design is usually less than 1% of the total life-cycle cost of a facility, the designer still has a large influence on what those life-cycle costs will ultimately be. Therefore, it is important that the consultant for each project be selected by a state agency or authority utilizing the Qualifications-Based Selection (QBS) process as mandated by federal and New York State legislation.

In summary, the Governor's office, the state legislature and all state agencies should take advantage of the lower costs and enhanced benefits that the private sector provides in developing and implementing their design and construction programs. This results in immediate and long term benefits to all New York taxpayers.

II. Background

In May 2007, the National Association of State Highway and Transportation Unions (NASHTU) report, "Highway Robbery II," asserted that the quality of outsourced designs were both too expensive and not up to DOT standards because of the large number of cost-plus contracts awarded by state DOT's. Similar sentiments have also been expressed in a press release on June 6, 2008 by the New York State Public Employees Federation (PEF) – "one of the largest local white-collar unions in the United States and New York's second-largest state-employee union."[1] PEF stated "...the Fiscal Policy Institute (FPI) determined millions of tax dollars were wasted annually through the use of expensive private consultants when, in most cases, public employees could do the same work for less."[2]

However, a recent article in the *Times Union*, an Albany newspaper, made the opposite case with regard to public sector salaries: "A report by the nonpartisan Employee Benefit Research Institute in June showed worker compensation costs are 51 percent greater for state and local governments compared with private sector employers. The study notes that it is difficult to compare the two work forces because of the differing natures of for-profit and public service and differing skill sets, but it indicates that the advantage of public sector work is the benefit package."[3]

In order to answer the debated question of whether it is more cost effective for design to be done in-house or contracted out, the American Council of Engineering Companies (ACEC) New York asked Polytechnic Institute of NYU to objectively analyze the relative cost of consulting services for each option available to state government.

The percentage of work performed in-house versus that which is contracted out varies among NY State agencies and authorities. NYSDOT, for example, traditionally has performed 50% or more of their work with in-house forces, and in some Regions the in-house design exceeds 80%. As we believe this to be a very high percentage of in-house work when compared to other NYS agencies and authorities, we have chosen to focus this cost effective comparison on transportation projects and the NYSDOT. This is not to say that the NYSDOT has not performed studies on this issue before, however, the most recent study NYSDOT contracted out to KPMG dates back to 2001.

A basic philosophy of this report is that any government design and construction agency should not consider itself as a sole operating agency, but rather the leader in a public – private partnership consisting of its own organic engineers and administrators and its private consultant and contractor teams. The private sector is a "force multiplier" for public design and construction agencies. The amount of work that a design and construction agency can do, even with a workforce of 3300 engineers and technicians such as the NYSDOT is authorized, is miniscule compared with what it can do with its public – private team.

III. Reasons for Outsourcing Design and Inspection Projects

Introduction

A number of factors other than cost have become key drivers for outsourcing. There is considerable political support for outsourcing a major portion of the design and inspection workload affecting policy in this area. The DOT cannot staff up every time there is a substantive increase in project workload that leads to decisions based on staffing capacity. It may be beyond the capability of in-house staff to accommodate schedule constraints. The need for innovation may affect decisions about outsourcing as well as the need to manage risks, improve quality, and provide for special expertise. If it lacks the specific expertise, the DOT often has no choice but to outsource the design.[4]

Decision Based on Policy

The fundamentals of a capitalistic society imply that the free market can provide goods and services in a more productive manner than a government-managed enterprise can. As the political pendulum moves between free market capitalism and strong government control, the fundamental principles are applied to varying degrees. However, one basic principle always remains; the government does not compete with private enterprise. This concept is codified in the Office of Management and Budget Circular A-76, first produced in 1966, revised in 1967, 1979, 1983 and 2003. The basic concept has remained unchanged throughout the years and through many different administrations. The Circular provides the following definition of a commercial activity.

> A commercial activity is a recurring service that could be performed by the private sector and is resourced, performed, and controlled by the agency through performance by government personnel, a contract, or a fee-for-service agreement. A commercial activity is not so intimately related to the public interest as to mandate performance by government personnel. Commercial activities may be found within, or throughout, organizations that perform inherently governmental activities or classified work.[5]

This Circular states that the government shall not start or carry out any activity to provide a commercial product or service if the product or service can be procured more economically from a commercial source. The Council of State Governments reports that some states do unfair analyses to stop privatization. Unfortunately, the term "more economically" is ambiguous enough to allow this.

The rationale for having governmental design and inspection capabilities within state departments of transportation (or other design and construction agencies) is to maintain the ability to protect the public in emergencies and situations in which commercial organizations are insufficiently responsive and to maintain the capability of managing routine contracts with commercial firms. The rationale for performing design and inspection work in-house is to maintain currency within the design management staff and to allow sufficient design work to attract and maintain top notch design engineers. Therefore a target to accomplish the government goals and in-house training goals might be a design work load of 25% in-house and 75% outsourced. This was, in fact, the guideline used by the U.S. Army Corps of Engineers, New York District, from 1983 to 1986.

Decision Based on Staffing Capacity

Transportation infrastructure funding is never constant. It varies from year to year and depends on many factors. The NYSDOT is authorized for approximately 3300 positions related to design and engineering. All of these positions are never filled simultaneously, and the DOT is therefore always operating below its full potential. In addition, the DOT has a much larger mission than simply design and inspection of transportation projects. Therefore when project funding is high, as it has been in recent decades, it is impossible for the DOT to perform the design and inspection services in-house. If the DOT were to staff to a level capable of performing its highest workload, it would be paying idle staff during the lean years when there is little design work. Since layoffs are extremely rare, once hired, a DOT employee can typically remain a DOT employee for his or her entire career, regardless of workload. If a project is outsourced, a consultant employee is paid only for the time he or she works on it and leaves when the project is completed.

Decision Based on Schedule Constraints

Staffing issues and special expertise may also dictate that outsourcing be used because of scheduling constraints. This issue is related to capacity, expertise and attitude. Generally speaking, consultants have more flexibility to meet deadlines than in-house design forces. From a strictly administrative view point, a consultant can bring a sub-consultant to a job much faster than a government agency can negotiate a contract or hire more staff. In addition, consultants are more focused on meeting deadlines. They have to satisfy the agency if they want to continue to receive work. If a particular project requires some specific expertise, a consultant can get the expertise much faster than a government agency. A World Bank study of outsourcing infrastructure projects found that outsourced projects are 60 percent more likely to be fully completed, take an average of 9 months less to complete, and are more than four times as likely to be rated successful by project managers and financers.[6]

Decision Based on Lack of Special Expertise

There are instances when the DOT must deliver products and services that it is not equipped to deliver. For instance, it may be unable to accommodate networking, modeling, or database activities for a project requirement. Or it may have a lack of sufficient experience in seismic design for a critical transportation structure. To effect the project delivery, the DOT may avail itself of the necessary expertise through outsourcing. The same conclusions have been expressed in a KPMG Audit (Executive Summary section):

> The analysis shows that consultants work on larger, more complex projects compared to those designed and inspected in-house. Consultants design projects that are on average five times larger than those designed in-house and average over $7 million in construction costs. This is due to the staffing demands and technical nature of these projects that cannot be adequately filled by the [NYSDOT] regions.[7]

Decision Based on the Need for Innovation

The DOT may look to the private sector in its efforts to spur innovation. In the 1990's, the Williamsburg Bridge (NYC) was badly in need of replacement or major renovation. To tap the ideas of the engineering community, a design competition was held. A panel of judges reviewed the designs and selected a course of action. There are many other examples of the desire for innovation being a driver toward outsourcing.

Outsourcing can produce innovative solutions in transportation projects. It can allow old processes to be discarded in favor of entirely new ones that integrate technological advances and spur new ways of communication. At least one in five state agencies says that improved innovation was one of the reasons for outsourcing. Perhaps one of the reasons that outsourcing has a higher potential for innovation is that the private sector has more means to encourage innovation that government agencies, including bonus programs and the sharing of intellectual properties. Most government agencies cannot, by tradition and regulation, provide these types of incentives.[8]

Decision Based on Better Management of Risks[9]

A basic principle in leadership of technical activities is the equitable distribution of risk. Uncontrollable risk should be shared when possible. However, controllable risk should be assigned to the entity that has control of it. Outsourcing is a way of controlling risk to the agency. If a project is performed in-house, the risk is assumed by the agency, which is self-insured. Should there be design flaws caused by errors or omissions, the cost will ultimately be borne by the agency. A contract is a vehicle whereby that type of risk can be shifted to the consultant that has control over the design. Consultants either self-insure or carry insurance for errors and omissions. Using the cost of premiums, insurers protect themselves by requiring that consultants maintain quality assurance programs, providing yet another advantageous way for the outsourcing agency to use the contract as a management tool for increasing accountability and efficiency.

Decision Based on Improving Quality[10]

It is generally accepted that a bidding process that uses lowest price as the only criterion to select an engineering firm will not yield the best professional services. This underlying principle has led the federal government, New York State, and New York City to adopt "Qualifications-Based Selection" for the procurement of professional services such as design and inspection.[11] This concept recognizes that the design and inspection of new construction, rehabilitation and maintenance of capital projects represent a tiny fraction of the overall life-cycle cost of these projects.

Few state or federal agencies award design contracts based solely on low bids. Most have selection boards that evaluate proposals, select short lists of most competitive consultants, listen to presentations, and recommend the most competitive consultant for the design contract. Consultants are very cognizant of the fact that selection boards have long memories – they will remember the overall performance of a previously selected firm.

There have been no competent comparison studies of the design quality of outsourced and in-house designs. However, when incentives and other factors for producing a quality design are considered, outsourcing is favored:

1. The consultant has a great incentive to produce a quality design.
2. The consultant was probably vetted through a "Qualifications Based Selection" process.
3. The consultant designer has a DOT project manager adding to his or her internal management.
4. The consultant designer can hire and fire employees far more easily than a government agency.

The U.S. General Accounting Office has shown that the cost of design represents 1% or less of a project's overall life-cycle costs. However, the design is determinative of what the life-cycle cost of a project will be. A poor design approach can raise costs unnecessarily - a substandard design can result in cost overruns that greatly exceed the cost of the design itself. To that extent, the American Public Works Association counsels that design professional services should always be obtained via Qualifications Based Selection.[12]

Decision Based on Cost Effectiveness

There are two basic cost elements associated with the procurement of engineering design and / or inspection services. The first is the cost of the design or inspection services. These consist of the direct salary, fringe benefits, overhead, and, in the case of consultants, profits associated with the design process. Considering this cost only, it should be fairly easy to compare the cost of performing the service in-house outsourcing it. If the same staffing mix of senior and junior professionals and technicians is assumed, it should be possible to compare the direct salary, fringe benefits, overhead, profit, and lost revenue on those lost wages and profits and see which costs less. Unfortunately, it is not that easy. The total costs of consultants are contained in their proposals - precise direct salary rates, fringe rates, specified overhead rates, and regulated profits. Additionally, DOT keeps track of the consultant management cost of in-house staff. However, in-house costs are rarely comparable since the DOT accounting system does not include all overhead costs associated with in-house professionals. For instance, occupancy (rent) costs for state-owned buildings are not considered an overhead cost. Costs associated with administrative functions involving other agencies such as audit, civil service, etc. are not included in overhead costs.

> ***...it is not difficult to determine the cost of consultants---it is simply the amount paid—the cost of an in-house project depends on accurate recording of time spent on the project, the estimation of overhead, and the accounting of the cost of activities associated with the project (travel and subsistence, materials, supplies, and lab tests). Time sheets are not often a priority in state departments, and since many state employees are required to work on multiple tasks simultaneously, the record of time allocation is not very accurate.***[13]

The second element of cost effectiveness is the overall life-cycle cost of the project. The design costs of the project are generally considered to be less than 1% of the overall life-cycle cost of the project. A discussion of cost-effectiveness goes beyond the basic analysis of direct and indirect costs of private versus public delivery of products and services. Perhaps the most significant cost for delivery of a project relates to the delivery deadline. For example, if a project requires engineering and design work, the DOT will have to decide whether to perform the work in-house or outsource it to an engineering firm. A direct analysis of costs may show that this type of design work could be performed for less money by in-house staff, but that work might be delayed because of a heavy project backlog. When such a project is delayed, additional costs must be considered. There can be an inflation increase to the construction costs and also a relative increase in design costs. Together, they represent larger cost factors than the small incremental increases that might be incurred with outsourced engineering and design. The argument that the public sector is cheaper and should therefore perform all activities loses its validity if state forces are unable to perform the work for some period because of workload constraints.

Finally, a lack of special expertise needed for a complex project can result in serious design flaws. When such design flaws are not discovered until construction is well underway, the resultant mistakes can be costly – and sometimes result in litigation. These types of issues are well documented in construction literature and the resulting costs may far exceed the total cost of the design effort, whether it is performed in-house or outsourced.

Finally, the entire element of controlling costs is a given when using private design consultants; An agency that relies on consultants for the vast majority of their work can absolutely control yearly budgets based on the contracts that are awarded and administered. An agency relying mostly on in-house staff not only faces these costs regardless of need or use, but also other costs that drive expenses upwards such as employee healthcare and pensions.

IV. Base Cost Elements

Direct Salary

We define direct salary as an engineer's total income, which is inclusive of bonuses and profit sharing. This amount will vary by their title, experience, and area of expertise.

Fringe Benefits

These benefits are separate from the direct salary. Other names for them are "employee benefits, perks and benefits in kind (British English)."[14] Categories that fall under this heading include, but are not limited to:

- Medical Insurance (health, dental, vision)
- Social Security Insurance
- Pension Plan
- Unemployment Insurance
- Survivors Benefits
- Workers Compensation

Overhead

These are costs, exclusive of direct salary and fringe benefits, required for the organization to function. Overhead is commonly given in terms of the ratio of indirect costs to the direct labor cost. It may also be further classified into two categories, functional and administrative overhead.

Functional Overhead

These are the "indirect support costs that are attributable to a specific transportation program, but which cannot be practically assigned to a particular project."[15] Categories that fall under this heading include, but are not limited to:

- Program management
- Training Costs
- Supervisory costs
- Other than project management costs
- Rent, equipment and office support

Administrative Overhead

These are the "administration costs and those costs incurred by other agencies or departments...which provide support services...."[16] Categories that fall under this heading include, but are not limited to:

- Human resources
- Executive management
- Legal support
- Accounting
- Procurement

V. NYSDOT's In-House Engineer Cost

Direct Salary

To find the direct salary of in-house engineers, the weighted average of **nearly 3,300** engineer salaried positions related to NYSDOT highway/road design and inspection projects was calculated. The salaries for the positions were found by corresponding salary grades with their respective titles.

The weighted average direct salary of in-house engineers was found to be $71,682.66 per year. There is no research that shows a difference in skill level and professional competence between a private designer or inspector and a NYSDOT designer or inspector. However, there is a difference in the straight-time work duration for which consultant employees and NYSDOT employees are paid an annual salary.

The NYSDOT workweek is 37½ hours per week. Time worked beyond this is either compensated time or overtime. A consultant employee's straight-time workweek is typically 40 hours per week. Additionally, new NYSDOT employees earn vacation at 13 days per year beginning at 6 months and retroactive to their employment date. Vacation time increases by increments to 20 days per year after 7 years. Sick leave is earned up to 13 days per year. There are also 12 paid holidays and 5 paid personal days per year. This results in a productive number of weeks in a year for a DOT employee according to the following schedule:

Number of	Week/year	Days/year
Paid Vacation (steady state)	*4.0*	*20*
Paid Sick Leave	*2.6*	*13*
Paid Personal Time	*1.0*	*5*
Paid Holidays	*2.4*	*12*
Total Paid Duration (No Work)	10.0	50
Total Paid Duration (Worked)	42.0	210

See End Note[17]

Since the average available working weeks for a consultant employee is 47 weeks out of 52 weeks in the year, a comparable annual direct salary for a DOT employee is corrected by a factor that reflects the straight work-time difference. This correction factor is equal to (47/42) x (40.0/37.5), or approximately 1.1936.[18]

NYSDOT Direct Salary = $71,682.66 x (47/42) x (40.0/37.5) = $85,564.06.

Fringe Benefits

To find the fringe benefits for NYSDOT Civil Engineers, we referred to Dr. Brodzinski's research paper sponsored by the NYSDOT. Dr. Brodzinski's findings in August 2002 showed that NYSDOT Civil engineer's fringe benefit package was valued at **41.54%** of their starting salaries.[19] A more recent value of the fringe benefit package was obtained from The New York State Office of the Comptroller's Accounting Bulletin A-578 for the fiscal year 2010 – 2011. This A-Bulletin valued the fringe benefit package for NYSDOT employees at **44.09%** when federal funds were involved.[20] It was slightly higher (48.43%) if no federal funds were involved. Since the bulk of the projects under consideration in this study will in all probability involve federal funds, that value will be used herein. The following is a breakdown of these fringe benefits:

Health Insurance	21.63
Pensions	10.17
Social Security	7.62
Workers Compensation	2.43
Employee Benefit Funds	1.38
Dental Insurance	0.48
Unemployment Benefits	0.14
Vision Benefits	0.16
Survivor Benefit	0.08
Total Fringe if Federal Funds Involved	44.09

Overhead

Through personal communication with Mark Moody, NYSDOT Assistant Director of Contract Management, we were informed that the indirect cost overhead rate for year 2007 was approximately **149%.**[21] This value was published in the annual Indirect Cost Rate Proposal submitted to the Federal Highway Administration (FHWA), and it "includes rental costs associated with non-state owned facilities **but assigns no cost for state owned facilities.**"[22] Since the overhead value includes fringe benefits, the overhead value exclusive of fringe should be **104.91%.**

Summary of In-house Design Engineer Cost

Direct Cost		$ 85,564.06
Fringe	44.09% x Direct Cost	$ 37,725.19
Overhead	104.91% x Direct Cost	$ 89,765.26
Total		$ 213,054.51

VI. NY Private A/E Firms' Engineer Cost

Direct Salary

A sample of 16 firms from upstate New York and the New York City region was tabulated. The average direct hourly salary was submitted by each. The average direct salary for all 16 firms was computed as $70,224.70 with a coefficient of variation equal to 10%. The salaries submitted were based on data for 2010 through November 2010.

Fringe Benefits and Overhead

Fringe benefits for consultants consist of medical, life, and disability insurance, payroll taxes, Social Security, Medicare, tuition reimbursement, sick days, holidays, vacation and pension. These benefits are generally not as generous as the NYSDOT's and no consultant can afford a defined benefits pension package. To obtain the fringe benefit and overhead rate for private consultants in 2010, the data was collected through the survey of ACECNY member firms. The computed average of upstate and downstate firms is **140.97%.**[23]

Firm	Avg. Direct Salary All Projects	Annual Salary	Overhead (INCLUDING FRINGES)	Annual Overhead & Fringe	Total Annual Salary
A	$28.20	$58,656.00	150.00%	$87,984.00	$146,640.00
B	$34.80	$72,384.00	169.00%	$122,328.96	$194,712.96
C	$46.13	$95,950.40	145.85%	$139,943.66	$235,894.06
D	$35.33	$73,486.40	153.52%	$112,816.32	$186,302.72
E	$26.41	$54,932.80	148.00%	$81,300.54	$136,233.34
F	$31.90	$66,352.00	151.00%	$100,191.52	$166,543.52
G	$30.30	$63,024.00	127.00%	$80,040.48	$143,064.48
H	$46.40	$96,512.00	114.00%	$110,023.68	$206,535.68
I	$33.56	$69,804.80	135.00%	$94,236.48	$164,041.28
J	$29.90	$62,192.00	134.00%	$83,337.28	$145,529.28
K	$37.55	$78,104.00	123.00%	$96,067.92	$174,171.92
L	$37.51	$78,020.80	156.91%	$122,422.44	$200,443.24
M	$26.47	$55,057.60	109.00%	$60,012.78	$115,070.38
N	$35.54	$73,923.20	155.70%	$115,098.42	$189,021.62
O	$41.51	$86,340.80	145.00%	$125,194.16	$211,534.96
P	$18.68	$38,854.40	138.50%	$53,813.34	$92,667.74
AVERAGE	$33.76	$70,224.70	140.97%	$98,994.00	$169,218.70

ACECNY New York Firm Statistics (2010)

Profit

For NYSDOT contracts, the amount allowed for profit is fairly fixed by the DOT contract administration. Consultants are given a "fee" (DOT uses "fee" in lieu of "profit") guideline for their DOT contract proposals. The following fee guideline was found on the NYSDOT's Web site:

> *Fee is authorized at a rate of 11% when any individual consultant's aggregate fee components are less than $500K and at a rate of 10% when any individual consultant's aggregate fee components equals or exceeds $500K. Project complexity will also be a consideration in the calculation of the fee component. The $500K threshold is a cumulative amount applicable to each individual consultant in an agreement and is carried forward should supplemental agreements be required.2324*

Informal discussions with consultants have also suggested that 10% of burdened salary is a good estimate. Therefore, for the purposes of this comparison, the figure of 10% was used.

Summary of Consultant Design Engineer Cost

Direct Cost		$ 70,224.70
Overhead & Fringe	140.97% x Direct Cost	$ 98,995.76
Profit	10.00% x (Direct Cost + Overhead + Fringe)	$ 16,922.05
	Total	$ 186,142.51

See End Note[25]

VII. In-House Cost vs. Private A/E Firm Cost Analysis

Deterministic Analysis

In this type of analysis, single point best estimates were used to calculate the costs in order to compare the total annual cost of a NYSDOT design engineer with that of a consultant design engineer. The comparison is summarized below:

Year 2007

	NYS DOT Engineer	Consultant Engineer
Direct Salary	$74,463.28	$58,624.37
Fringe Rate	45.53%	27.87%
Overhead Rate	103.47%	124.63%
Fringe amount	$33,903.13	$16,338.61
Overhead amount	$77,047.16	$73,063.55
Subtotal	$185,413.57	$148,026.53
Profit (10%)		$14,802.65
Total	**$185,413.57**	**$162,829.19**

Year 2010

	NYS DOT Engineer	Consultant Engineer
Direct Salary	$85,564.06	$70,224.70
Fringe Rate	44.09%	140.97%
Overhead Rate	104.91%	
Fringe amount	$37,725.19	$98,995.76
Overhead amount	$89,765.26	
Subtotal	$213,054.51	$169,220.46
Profit (10%)		$16,922.05
Total	**$213,054.51**	**$186,142.51**

While the annual cost for a DOT employee is fairly close to the average annual cost of a consultant, it does not tell the whole story. If on a given day weather shuts down an in-house inspection project, the DOT employee goes back to the office and is paid for work on that project. If weather shuts down a consultant inspection job, the consultant is not paid for that day's work on that project. Over the course of a DOT employee's career, there is a considerable amount of time for which he or she is paid for work that is not associated with the project to which he or she is assigned. Based on this analysis, the DOT employee costs the taxpayer over $ 6.4 million dollars; these costs are described below.

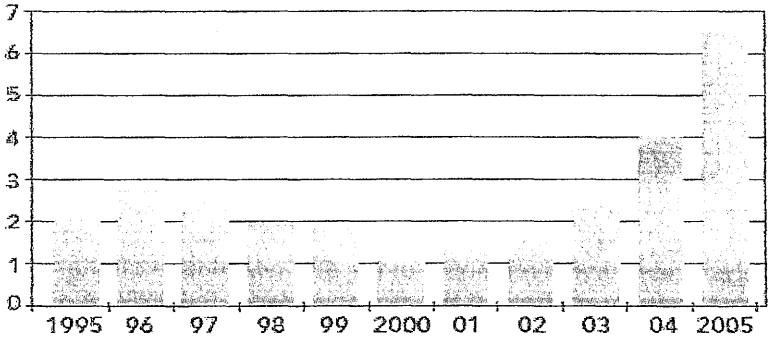
Average pay over career	**$**	**85,564**
Years of service		**30**
Total Direct Salary, 2010	**$**	**2,566,922**
Fringe Rate		**44.09%**
Total Fringe	**$**	**1,131,756**
Overhead Rate		**104.91%**
Total Overhead	**$**	**2,692,958**
Total Career Cost to the Taxpayer	**$**	**6,391,635**

This analysis has considered some of the authorized time off that permitted a DOT employee by contract. It has not considered the utilization of the design engineer. It is not uncommon for a professional employee to spend 100 to 200 hours per year on professional development and training. In addition, New York State and the federal government stipulate that state employees receive training on certain legal, regulatory and administrative requirements, including affirmative action, discrimination issues and health in the work place. There are many other demands placed on government employees - attending non-project related meetings, preparing presentations, briefing bosses, and responding to emergencies involving public safety. Although there is no data to quantify these impacts to productivity, the non-productive utilization probably approaches or exceeds 30%.

VIII. The Cost of NYSDOT Pension Plan

Growing pension fund expenses have fueled the fiscal stresses affecting every level of government in New York State. While these costs are cyclical in nature, they seem to go out of control in times of poor security market performance, in times of economic slowdowns or in outright recessions, when the state government can sorely afford the costs.

Tax-funded contributions to public pensions in New York State rose from $1 billion in 2000 to approaching $7.5 billion in fiscal year 2006.2526 The increases are shown in figure 1.



Source: New York State and Local Retirement System, 2005 Comprehensive Annual Financial Report; New York State Teachers Retirement System, 2005 Annual Report; City of New York, Comprehensive Annual Financial Report

Figure 1.
Tax-Funded Pension Costs in New York State Public Employer Obligations, 1995 – 2005 (billions of dollars)2627

The reason for this fiscal time-bomb is the structure of the pension benefits plan. Private employers have known for decades that a defined benefits retirement plan is unaffordable. This type of plan places an future burden on a pension fund that is virtually uncontrollable.

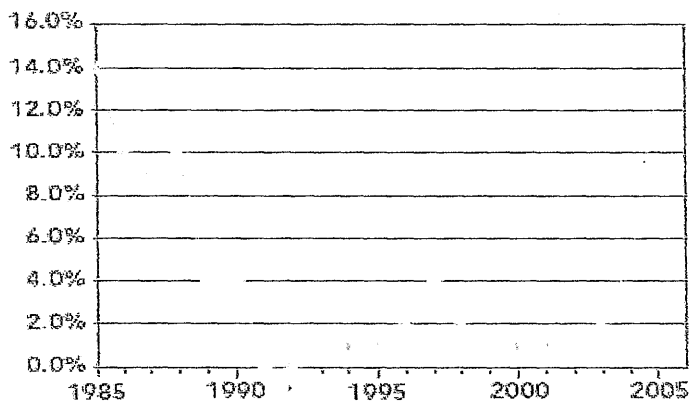
> "The pension problem is not simply a function of the 2000-2003 stock-market slumps or of Albany's 2000 increases in pension benefits, although both helped precipitate the latest crisis. The real cause is the fundamental design of the pension system itself, which obscures costs and wreaks havoc on long-term financial planning.

In the past three years, officials of the state and city retirement systems have sought to minimize the impact of pension cost increases by adjusting contribution schedules, "smoothing" investment return assumptions over longer periods, and allowing government units to "amortize" their increased contributions over a number of years.

This kind of tinkering merely pushes costs into the future and will not prevent future gyrations in pension contributions for government employers. Because the New York State Constitution does not allow pension benefits to be "diminished or impaired" for current public employees, nothing can be done to reverse the recent run-up in pension costs. But this system, which contributed to a previous budgetary meltdown in the Empire State, will remain a ticking fiscal time bomb if it remains unchanged."[28]

The state should move to a defined contribution plan – the type of plan used by the majority of private employers. A defined contribution plan requires a contribution by the employee and a contribution by the employer. The benefits associated with the plan are based on the amount of funds contributed over the employment period and the rate of return on the investment of those funds.

As Figure 2 shows, the state's contribution to the defined benefits plan has risen dramatically over the past decade: as the rate of return on pension funds decreases and the defined benefits increases, the employer is required to contribute more to the fund.



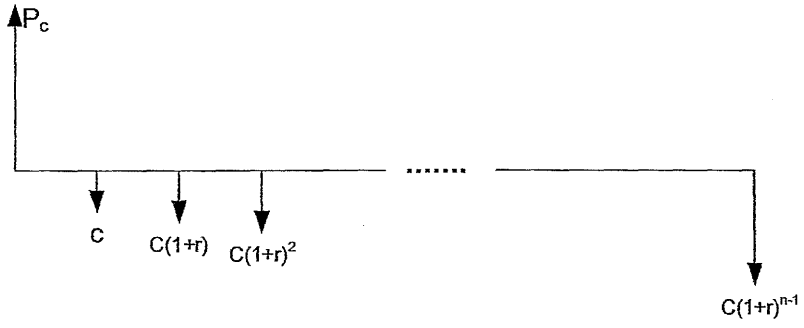
*New York State & Local Retirement System

Source: New York State & Local Retirement System

Figure 2.
The Pension Roller-Coaster contribution rate of salary, NYSLRS, 1995 – 2005

The employer's contribution for fiscal year 2010 is reported to be 10.17%.

To understand just how uncontrollable a defined benefits system is, consider the following cash flow diagram:



In this diagram, Pc represents the amount of funds necessary to payout a defined benefit, C. This defined benefit is increased annually by a cost of living percentage, r. If an employee retires at age 62, his life expectancy is about 81 years of age (or n = 19 years).[29]

$$\text{Then } P_c = c\left[\frac{1}{(1+i)} + \frac{(1+r)}{(1+i)^2} + \ldots\ldots + \frac{(1+r)^{n-1}}{(1+i)^n}\right]$$

where i is the current interest rate.

To get a more simplified expression, multiply the RHS by $\frac{1+r}{1+r}$

$$\text{Then } P_c = \frac{c}{1+r}\left[\frac{(1+r)}{(1+i)} + \frac{(1+r)^2}{(1+i)^2} + \ldots\ldots + \frac{(1+r)^n}{(1+i)^n}\right]$$

If we assume $r<i$, let $\frac{1}{1+w} = \frac{1+r}{1+i}$

$$\text{Then } P_c = \frac{c}{1+r}\left[\frac{1}{(1+w)} + \frac{1}{(1+w)^2} + \ldots\ldots + \frac{1}{(1+w)^n}\right]$$

The expression in the brackets sum to $\left[\frac{(1+w)^n - 1}{w(1+w)^n}\right]$

$$\text{Therefore } P_c = \frac{c}{1+r}\left[\frac{(1+w)^n - 1}{w(1+w)^n}\right] \quad \text{where } w = \frac{1+i}{1+r} - 1.$$

For example, let the interest, i = 4.5%, and the cost of living raise, r = 3%, then w = (1.045/1.03) – 1 =0.0146. Then

$$P_c = \frac{c}{1.03}\left[\frac{(1.0146)^n - 1}{0.0146\,(1.0146)^n}\right] = \frac{c}{1.03}(16.486) = 16.006c$$

Letting n = 19 years and assuming the average 3 year high salary for a DOT employee with 30 years' service at age 62 is $85,000(his annual defined compensation is, c = 30*0.02*85,000 = $51,000. Then the accumulated amount at his retirement, in order to payout $51,000 with anticipated 3% COLA raises is

$$P_c = 16.006c = \$51{,}000\ (16.006) = \$816{,}306$$

So, what does this cost the State of New York? Consider the cash flow diagram below. The problem becomes how one computes the constant payment that the state must make to accumulate a future value of $816,306 over a period of 30 years. If we assume the same 4.5% interest rate, then

$$A = \$816{,}306\left[\frac{0.045}{(1.045)^{30}-1}\right] = \$816{,}306(0.0154) = \$13{,}382\ \textit{annually}.$$

Since the employee contributes approximately 3% of his or her salary and the average direct salary is $71,682.66, the approximate percentage contribution by the employer over the years is (13,380/71,682.66) = 18.6% - 3.0% = 15.6%, assuming the employee continues to contribute 3% over the thirty year period. [30]

In actually, the employer contribution will not be constant over the years. As an employee's salary increases, the employer pays more: the state will pay in less when the employee is first hired and more later on. (The end amount of the employer contribution should be the same based on the assumptions in this analysis.)

New York State's contribution to the pension plan for 2010 was stated as 10.17%. This is equivalent to $7,303 annually based on the average salary. If the employee contributes 3.0%, the employee contribution is $2,154. Therefore, based on the assumptions in this analysis, the cost to the state is actually $3,924 more than the fringe benefit analysis stated above - adding an additional 5.5% to the fringe benefits and overhead cost. This increases the annual cost of each employee to $216,979 per year raising the career cost to about $6.5 million.

IX. A Stochastic Evaluation of In-house Design Costs

There is considerable variability in the estimates used to determine the in-house design cost of an average employee. These variations can be addressed using a process called Monte Carlo Simulation. In this type of simulation, a probability assumption is made for each major factor involved in the calculation of the total annual cost for a design engineer. As long as the factors are stochastically independent of each other and the probability assumptions are reasonable, we can address the variations in the final answer and make some probability assertions concerning the variability of that answer.

The process is as follows:

1. Compute the weighted average direct salary of an in-house design engineer.
   a. Take the average salary for each discipline and grade
   b. Multiply that average value by the number of authorized slots for that discipline and grade
   c. Assume variability in the stated salary by assuming a Normal distribution with a 10% coefficient of variability as shown in figure 3.

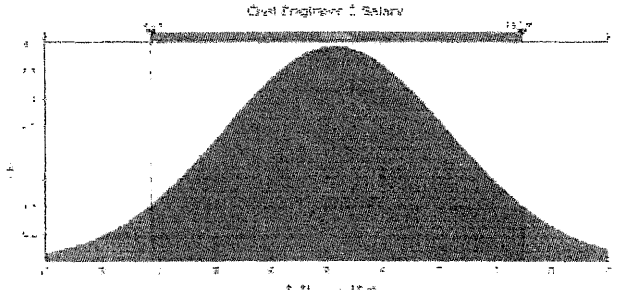


Figure 3. Example salary assumption for Civil Engineer 3 with the grade 27

   d. Sum the products of the average salaries and the number of authorized positions
   e. As each product and sum is made, a random number is generated between 0 and 1. The assumed probability distribution is integrated. Based on the value of the random number, a value for each product is found.
   f. A sum of those products is found and iteration started. This is repeated 1000 times and a relative frequency histogram is developed. This relative frequency histogram has many of the properties of a probability distribution with a mean and standard deviation.
2. Modify that value by productivity factors
   a. Calculate the modified direct salaries by the hours per week worked and the number of weeks per year worked using the following calculation.

NYSDOT Direct Salary = $71,682.66 x (47/42) x (40.0/37.5) = $85,564.06.

a. The variation in the amount of time worked is computed by the following assumptions:

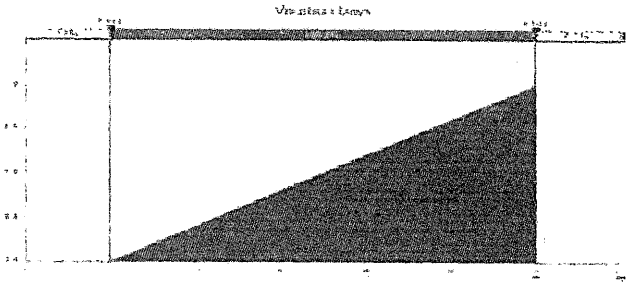


Figure 4. Paid vacation, triangular distribution, max of 4 weeks, expected 4 weeks, min of 3 weeks.

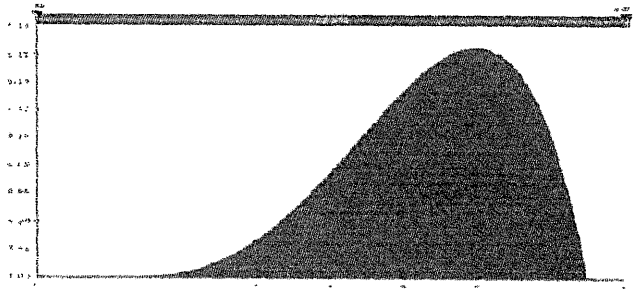


Figure 5. Sick Leave. Beta distribution, max of 13 days, expected of 10 days, and min of 0 days.

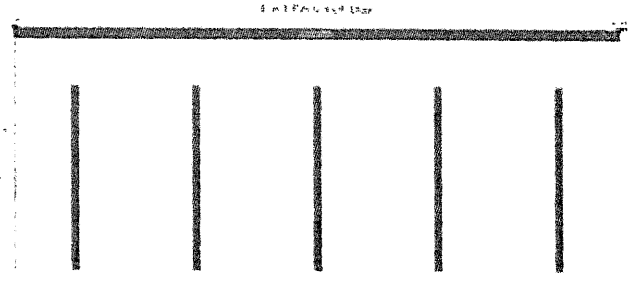


Figure 6. Personal Days 1 through 5 with equal probabilities, Paid holidays is estimated at 12 days with no variation.

3. Calculate the fringe benefits cost to the public by selecting the variation assumptions as follows:

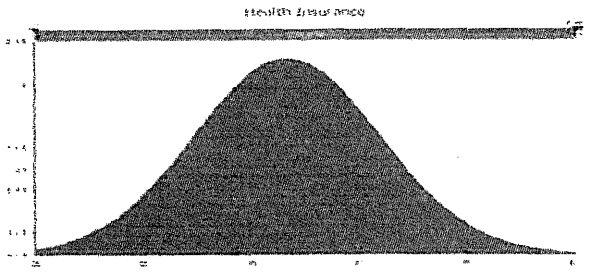


Figure 7. Health Insurance. Assume a mean of 21.63% of direct salary with a 20% coefficient of variation and a Normal distribution

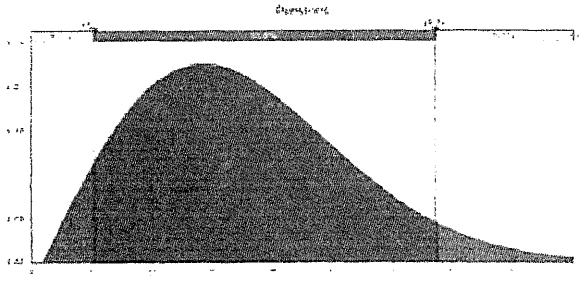


Figure 8. Pension Cost. Assume a Weibull distribution with a minimum of 10.17 and a scale of 3.75 that allows cost to reach the 11.03% (With 95% possibility) plus the additional 5.5% discussed above.

Social Security is considered a constant. The other fringe values varied with a Normal distribution with a 10% coefficient of variation.

4. Calculate the overhead costs to the public.

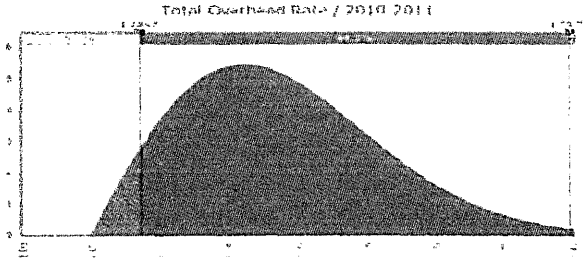


Figure 9. Overhead Cost. The overhead rate is believed to be understated with the 104.91% reported to the FHWA (this is less fringe benefits). Therefore a Weibull distribution is assumed with a location of 104.91% and a scale of 15% The shape factor of 2 keeps the mode biased towards the location factor.

5. Calculate the Total annual salary of an in-house design engineer. The annual salary is calculated by spread sheet using Monte Carlo simulations and result in the following relative frequency histogram.

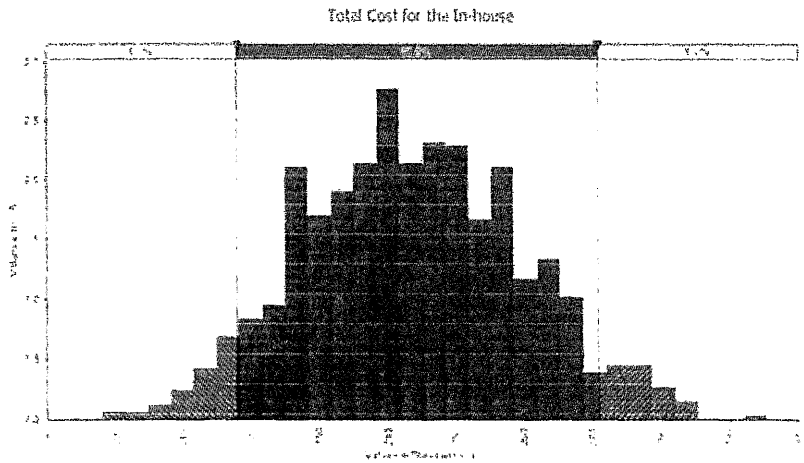


Figure 10. Relative frequency histogram showing the probabilities associated with the calculated annual cost to the tax payer for an in-house engineer.

This analysis shows that, based on the assumptions made, we have about a 90% assurance that the real cost to the tax payer is between $207,112 and $232 251 and an expected value of $219,023.

Note that the lowest probable value still exceeds the expected value of a private design engineer cost to the tax payer.

X. Summary and Conclusions

Rarely is cost of design or inspection the underlying sole reason for outsourcing these functions. Most often, other reasons dictate that consultants outside the agency should handle a project. Some of these other reasons are:

Decisions bases on policy. The government is not meant to perform functions that private organizations can perform equally well. Government design and construction agencies should be leaders in a public-private partnership team.

Decision based on staffing capacity. The public cannot afford to staff an agency to handle peak workloads. If the DOT staffed up to handle peak workloads, it is liable to pay those employees in lean times even if there is nothing for them to work on. Although recently, there have been incentives for early retirement, it is a difficult process to lay off state employee. If a project is outsourced, consultant employees are only paid for the time they work on it; they leave a project once it is over.

Decision based on schedule constraints. This issue is based on capacity, expertise, and attitude and must be addressed to complete critical projects on time. Consultants have more flexibility to meet fast-track deadlines than government agencies.

Decision based on lack of special expertise. Often, the DOT has no choice but to outsource the design if it lacks the required expertise in-house.

Decision based on the need for innovation. The private sector has more means to encourage innovation that government agencies, including bonus programs and the sharing of intellectual properties. Most government agencies cannot by regulation provide these types of incentives.

Decision based on better management of risks. A contract is a risk management tool that enables certain risks to be shifted to a consultant who has control over the design.

Decision based on improving quality. Since consultants compete against one another for work, they cannot submit a poor-quality design and expect to be selected again by the same agency. Past performance is a major gate-keeper in the selection of consultants.

Decision based on cost effectiveness. Even though the cost of design is less than 1% of the total life-cycle cost of a facility; the designer has a large influence on what those life-cycle costs will ultimately be. Therefore, it is important that the consultant for each project be selected utilizing the Qualifications based Selection (QBS) process as mandated by federal and New York State legislation.

While cost of a design engineer will generally be comparable whether he or she is in the public or private sector, this study found that because of the generous benefits package provided by the State of New York, the large amount of paid time off, and a reduced work week, an in-house design engineer's actual expected cost to the taxpayer exceeds that of a private design engineer by about 15%. These calculations are based on conservative assumptions and the actual difference considerably exceeds this value. The total cost of a career employee to the DOT is in excess of $6.4 million over a 30 year career.

The cost of the pension system in the state has risen from $1 billion in 2000 to about $7.5 billion in 2006. Based on our assumptions, the state has understated its contributions to the retirement system by about 5.5%. In our calculations we used a state contribution as stated by the NYSDOT of 10.17% and an employee contribution of 3.0%. To cover the cost of an individual retirement plan, a total contribution of 18.6% is required. Were this to be included in the calculations in this report, an additional $3,924 could be added to the expected annual salary.

Finally, a stochastic simulation was performed to allow variations in assumptions. Based on these simulations, we have a 90% assurance that the annual cost to the tax payer of a DOT design engineer will be between $207,112 and $232,251. The lower value is still slightly greater than the expected cost to the taxpayer of a consultant design engineer.

Appendix A.
Average Salary Calculations

2010 Salary Schedules NYS (Managemental Salary from 2008)						
Title Name	Salary Grade	Hiring Rate	Job Rate	Hiring & Job Avg.	NBR POS	Column Avg X Column NBR POS
Junior Engineer	15	$43,500	$55,455	$49,478	20	$989,550
Engineer in Charge	22	$63,041	$79,819	$71,430	95	$6,785,850
Engineering Geologist	15	$43,500	$55,455	$49,478	11	$544,253
Engineering Geologist 1	20	$56,813	$72,076	$64,445	39	$2,513,336
Engineering Geologist 2	24	$69,911	$88,256	$79,084	71	$5,614,929
Engineering Geologist 3	27	$81,856	$100,822	$91,339	9	$822,051
Senior Soils Engineer	24	$69,911	$88,256	$79,084	2	$158,167
Civil Engineer 1	20	$56,813	$72,076	$64,445	1726	$111,231,207
Civil Engineer 2	24	$69,911	$88,256	$79,084	861	$68,090,894
Civil Engineer 3	27	$81,856	$100,822	$91,339	201	$18,359,139
Civil Engineer 3 Materials	27	$81,857	$100,822	$91,340	4	$365,358
Civil Engineer 3 Structures	27	$81,858	$100,822	$91,340	18	$1,644,120
Civil Engineer 4	29	$90,684	$111,064	$100,874	42	$4,236,708
Civil Engineer 5	64	$114,961		$114,961	44	$5,058,284
Civil Engineer 5 Structures	64	$114,961		$114,961	5	$574,805
Civil Engineer 6	65	$127,794		$127,794	3	$383,382
Civil Engineer 7	66	$140,864		$140,864	1	$140,864
Deputy Chief Engineer Construction	67	$152,886		$152,886	1	$152,886
Deputy Chief Engineer Structures	67	$152,886		$152,886	1	$152,886
Dir NYC Structures Engineering	65	$152,886		$152,886	1	$152,886
Senr Structural Specifications Writer	23	$66,375	$83,954	$75,165	1	$75,165
Transportation Analyst	18	$51,268	$65,190	$58,229	135	$7,860,915
				Total->	3291	$235,907,633
				Weighted Average Salary ->		$71,682.66

Notes

In house engineering salaries are based on a 37.5 hr/week work week

Tiltel Code Begins with: General Civil (40), Spec Writing (49), Engineering Drafting (51), Transportation Specialist (21)

http://www.cs.state.ny.us/businesssuite/Compensation/Salary-Schedules/index.cfm?nu=PST&effdt=04/01/2006&fullScreen

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[16] Ibid.

[17] Employee Benefits. (n.d.) Retrieved November 4, 2010, from https://www.nysdot.gov/jobs/perm_positions/benefits

It should be noted that the total number of days taken off from work stated herein may be greater for in-house workers due to days they take for union business (PEF 2007-2011 Contract: Articles 4.7a and 4.8), jury duty, leave with pay during personal litigation, leave for professional meetings and examinations (PEF 2007-2011 Contract: Articles 12.15 and 12.16), leave for bereavement (PEF 2007-2011 Contract: Article 12.18a).

[18] One may arguably say that the correction factor shows that approximately 1.2 in-house civil engineer is used accomplish the work that a private consultant does under the assumption of equal utilization.

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[21] M. S. Moody (personal communication, July 2, 2008)

[22] M. S. Moody (personal communication, July 8, 2008)

[23] The member of ACEC New York (personal communication, Nov 16 2010)

[24] New York State Department of Transportation. (2006, June 19). *NEW YORK STATE DEPARTMENT OF TRANSPORTATION CONSULTANT INSTRUCTION.* Retrieved August 20, 2008, from https://www.nysdot.gov/portal/page/portal/main/business-center/consultants/consultants-repository/ci06-03.pdf

[25] Values may display slight errors due to MS Excel calculation round off.

[26] McMahon, E.J. (2006, June 7). *Defusing New York's Public Pension Bomb.* Retrieved October 07, 2008, from http://www.empirecenter.org/Documents/PDF/sr04-06.pdf

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[29] U.S. Social Security Administration, Office of the Chief Actuary. (2008, March 27). Period Life Table. Retrieved October 6, 2008, from Social Security Administration Website: http://www.ssa.gov/OACT/STATS/table4c6.html

[30] The employee contribution rate of 3% is a maximum rate and varies depending upon which Tier the employee is covered. Tier 2 requires no contribution. Tiers 3 and 4, generally, require contributions for the first 10 years of employment only.

http://audit.transportation.org/Documents/2010_Uniform_Audit_and_Accounting_Guide.pdf

For Audits of Architectural and Engineering (A/E) Consulting Firms

UNIFORM AUDIT & ACCOUNTING GUIDE

2010 Edition

Prepared by the American Association of State Highway and Transportation Officials (AASHTO) Internal/External Audit Subcommittee

Assistance and consultation provided by:

The Federal Highway Administration (FHWA) and American Council of Engineering Companies (ACEC)

An electronic version of this guide can be found at the AASHTO home page: www.transportation.org

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4

Chapter 4 – Cost Principles

4.1 – Overview of Federal Acquisition Regulation Part 31

State departments of transportation (DOTs) rely on FAR Part 31 for guidance when negotiating costs and reviewing project proposals with engineering consultants. The FAR contains cost principles and procedures for pricing contracts, subcontracts, and modifications to contracts.

The following is a general discussion of applicable cost principles described in FAR Part 31. This discussion is on a summary level only and is not intended to be a complete rendition of all cost principles contained in the FAR.

The provisions apply to commercial organizations, educational institutions, State, local and Federally-recognized Indian tribal governments, and nonprofit organizations. FAR 31.105, dealing with construction and architect-engineering contracts, states that the allowability of costs shall be determined in accordance with FAR Subpart 31.2. Accordingly, the following discussion focuses on Subpart 31.2– Contracts with Commercial Organizations.

The total cost of a contract includes all costs properly allocable to the contract under the specific contract provisions. The allowable costs to the Government are all costs that are reasonable, allocable, and are not prohibited by FAR Part 31.

In some cases, a contracting State DOT may enter into an advance agreement with an engineering consultant to clarify the allocability and allowability of special or unusual costs. FAR 31.109 provides further clarification of advance agreements, including examples of costs for which advance agreements may be important.

In the absence of any advance agreements, the auditor should determine the allowability of costs. To determine the allowability, the auditor should consider the following:

1. Any limitations set forth in Subpart 31.2 of the FAR;
2. Allocability;
3. Cost Accounting Standards (CAS) promulgated by the Cost Accounting Standards Board (CASB); if applicable, otherwise, Generally Accepted Accounting Principles and practices appropriate to the particular circumstances;
4. Terms of the contract; and
5. Reasonableness.

4.2 – REASONABLENESS AND ALLOWABILITY

[References: FAR 31.201-2, FAR 31.201-3]

A. Generally

Cost elements must be addressed for reasonableness in accordance with FAR 31.201-2 and 31.201-3. Reasonableness concerns may arise in any number of cost categories, including indirect labor and fringe benefits, among others. For example, the amount of indirect labor in the indirect cost pool in relation to direct labor may cause concerns regarding a firm's efficiency and the extent to which the Government should reimburse costs through the overhead rate. Additionally, certain categories of fringe benefits also may generate reasonableness concerns, especially in the case of privately-held firms with compensation cost structures not subject to the constraints of stockholders' oversight.

Note: *The following section discusses the reasonableness of general cost items. See Chapter 7 for specifics regarding determining the reasonableness of compensation costs.*

B. Requirements of FAR 31.201-2 and FAR 31.201-3

FAR 31.201-2, Determining Allowability, provides the following (emphasis added):

(a) A cost is allowable only when the cost complies with all of the following requirements:

(1) *Reasonableness.*

(2) Allocability.

(3) Standards promulgated by the CAS Board, if applicable; otherwise, generally accepted accounting principles and practices appropriate to the circumstances.

(4) Terms of the contract.

(5) Any limitations set forth in [FAR 31.201].

FAR 31.201-3, Determining Reasonableness, provides the framework for addressing the reasonableness of costs (emphasis added):

(a) A cost is reasonable if, in its nature and amounts, it does not exceed that which would be incurred by a prudent person in the conduct of competitive business. Reasonableness of specific costs should be examined with particular care in connection with firms or their separate divisions that may not be subject to effective competitive restraints. No presumption of reasonableness shall be attached to the incurrence of costs by a contractor. If an initial review of the facts results in a challenge of a specific cost by the contracting officer or the contracting officer's representative, the burden of proof shall be upon the contractor to establish that such cost is reasonable.

(b) What is reasonable depends upon a variety of considerations and circumstances, including—

(1) Whether it is the type of cost generally recognized as *ordinary* and necessary for the conduct of the contractor's business or the contract performance;

(2) Generally accepted sound business practices, arm's length bargaining, and Federal and State laws and regulations;

(3) The contractor's responsibilities to the Government, other customers, the owners of business, employees, and the public at large, and

(4) Any significant deviations from the contractor's established practices.

C. Methodologies for Applying FAR 31.201-3

While the tests, standards, and other considerations referenced in FAR 31.205-3 entail varying degrees of subjectivity and professional judgment, it is strongly recommended, as a best practice, that greater emphasis be placed on quantitative analysis in addressing the reasonableness of costs. Specifically, ordinary costs are amounts that are common, usual, and otherwise characteristic of the industry segment. When analyzing cost elements for reasonableness, engineering consultants and auditors are strongly recommended to use the concept of ordinary cost as a starting point, as discussed below.

1. Determining Ordinary Cost Through Quantitative Analysis

The starting point in the analysis of reasonableness of a specific cost element is the establishment of an ordinary level of cost as a baseline for the analysis. The methodology for establishing this baseline may vary depending on the circumstances.

(a) Ratio Analysis. The methodology may include the use of ratios, for example, the use of mean or median values as a percentage of either direct labor or net revenues by type of engineering services, size of firm, and location, among other parameters. When this methodology is used, the ratios and other comparative statistics may be derived from nationally-published, independent industry surveys.

(b) Analysis of Trend /Historical Data. The methodology for establishing baseline costs also may include the use of trend analysis and/or analysis of historical cost data. When trend analysis is used, consideration should be given to both the trend within the firm in question as well as the industry overall. Additionally, a combination of both survey and trend analysis, as well as other empirically-based methodologies, may be used.

(c) Analysis of Variances. Once baselines for specific cost elements are established, variances in excess of benchmark thresholds, if determined to be material on the basis of professional judgment, should be identified, analyzed, and addressed by the engineering consultant and/or in the auditor's workpapers within the context of a multi-factor analysis, in accordance with the considerations outlined by FAR 31.205-3 and other related regulations. If costs with material variances are determined to be reasonable, then the basis for acceptance of the variances in the context of FAR 31.205-3 should be explicitly identified in the audit workpapers, so that the cognizant agency or other reviewer is made fully aware of the facts underlying this determination.

2. Determining Reasonableness: Common Cost Categories

Cost categories of frequent concern with respect to reasonableness include, but are not limited to, executive compensation (see Chapter 7), indirect labor, vehicle costs, travel costs, occupancy costs, pension costs, and the various elements of fringe benefits.

4.3 – ALLOCABILITY

[Reference: 31.201-4]

A cost is *allocable* if it is assignable or chargeable to one or more cost objectives or cost centers on the basis of either the relative benefits received or some other equitable relationship. A cost must be distributed in some reasonable proportion to the benefits derived. A cost is allocable to a Government contract if it:

1. Is incurred specifically for the contract (direct cost);
2. Benefits both the contract and other work, and can be distributed to them in reasonable proportion to the benefits received (direct and indirect cost); or
3. Is necessary to the overall operation of the business, although a direct relationship to any particular cost objective cannot be shown (indirect cost only).

4.4 – UNALLOWABLE COSTS

[References 31.201-6, CAS 405 (48 CFR 9904.405)]

Costs that are expressly or mutually agreed to be unallowable, including directly associated costs, must be identified and excluded from any billing, claim, or proposal applicable to a Government contract. A directly associated cost is any cost which is generated solely as a result of incurring another cost, and which would not have been incurred had the other cost not been incurred. When an unallowable cost is incurred, its directly associated costs are also unallowable. The practices to account for and present unallowable costs are described in CAS 405 (48 CFR 9904.405), Accounting for Unallowable Costs.

4.5 – DIRECT AND INDIRECT COSTS

[References: FAR 31.202, FAR 31.203]

In evaluating an engineering consultant's overhead, auditors should consider direct as well as indirect costs. A direct cost is any cost that can be identified specifically with a particular contract or project. Costs identified specifically with a contract or project are direct costs and must be charged directly to the contract or project. All costs specifically identified with a project are direct costs of that project and may not be charged to another project, either directly or indirectly. Finally, a cost may not be charged as direct and also be included in an indirect cost pool. For reasons of practicality, any small dollar direct cost may be treated as an indirect cost if the accounting treatment is consistently applied to all projects and produces substantially the same results as treating the cost as a direct cost. However, any variances and credits should then also be treated as indirect costs.

Indirect costs should be accumulated by logical cost groupings with due consideration of the reasons for incurring such costs. Commonly, manufacturing overhead, selling expenses, and general and administrative (G&A) expenses are separately grouped. The engineering consultant must record indirect costs in accordance with GAAP and must consistently allocate these costs to intermediate or final cost objectives, as appropriate.

4.6 – APPLICABILITY OF COST ACCOUNTING STANDARDS

Contracts may be subject to the Cost Accounting Standards (CAS) promulgated by the Cost Accounting Standards Board (CASB), an independent board that reports to the U.S. Office of Management and Budget's Office of Federal Procurement Policy. Certain CAS provisions are incorporated into FAR Part 31 and apply to most Federal-aid projects reimbursed under actual-cost agreements, while other provisions apply only to large contracts. Engineering consultants that are subject to full CAS coverage for Federal contracts also should use full CAS-based cost accounting practices for State DOT contracts.

Note: *For details regarding CAS Program Requirements, see FAR Subpart 30.2.*

4.7 – ALLOCATION BASES FOR INDIRECT COSTS

[Reference: FAR 31.203(c)]

Generally. Allocation bases are used to distribute/allocate overhead costs to intermediate or final cost objectives. An allocation base common to all cost objectives or projects should be selected for the allocation of indirect costs. Although most engineering consultants use direct labor as the sole base for developing overhead rates, some engineering consultants have rate structures that are more complex and use multiple allocations bases to allocate costs. A typical example follows:

EXAMPLE 4-1: COMMON ALLOCATION BASES

Cost Pool	Allocation Base
Employee Fringe Benefits	Direct Labor
Overhead Expenses	Direct Labor and Fringe Benefits
General & Administrative Expenses	Total Cost Input*

** When using the Total Cost Input allocation base, the base includes direct labor, indirect labor, fringe benefits, general overhead, unallowable costs, materials, and costs for subconsultants.*

Rate Structures and Cost Allocation Methods. Once an appropriate base for distributing indirect costs has been accepted, the base should not be fragmented by removing individual elements. Rate structures and cost allocation methods must be consistently applied to all contracting entities, including State DOTs. As an example, a consultant with a single, company-wide cognizant audited rate should not establish and apply a segment rate for a contracting entity when the costs included in the segment rate also are included in the company-wide rate. Likewise, direct costs must be consistently allocated and applied to all benefited objectives, regardless of specific contract provisions. As an example, if a firm accounts for and allocates computer cost direct to benefited objectives, and a contracting entity negotiates not to allow computer costs as a direct cost by contract, the computer costs associated with this contract must be consistently allocated as a direct cost to this project.

Base Period for Allocating Indirect Costs. As provided in FAR 31.203(g)(2), " . . . the base period for allocating indirect costs shall be the contractor's fiscal year used for financial reporting purposes in accordance with generally accepted accounting principles. The fiscal year will normally be 12 months, but a different period may be appropriate (e.g., when a change in fiscal year occurs due to a business combination or other circumstances)." When a contract is performed over an extended period, as many base periods shall be used as are required to encompass the total period of contract performance. In certain instances, an agreed-upon provisional rate may be established for use over the duration of the contract.

5

Chapter 5 – Cost Accounting

5.1 – Allocation Bases, Generally

As discussed in Chapter 4, allocation bases are used to assign/allocate certain overhead or other indirect costs to final cost objectives (projects). There are various allocation bases commonly used in cost accounting systems for allocating indirect costs; however, for engineering contracts administered by State DOTs, *direct labor cost* is the most frequently used base. Whatever base is used for cost allocation, it should be *consistent* for all contracts. Some of the common methods are discussed below.

A. Direct Labor Cost

Direct labor cost is the most common, accepted base used to allocate overhead costs on State DOT contracts. Direct labor costs generally are computed by multiplying all direct project labor hours by labor rates, as summarized for all employees within the applicable allocation unit. Labor rates are based on actual employee wages incurred.

B. Direct Labor Hours

The direct labor hour method is another way to allocate indirect costs based on total direct hours charged in an appropriate allocation unit.

C. Total Labor Hours (Total Hours Worked)

This method is similar to the Direct Labor Hours allocation base, except that the base includes all hours incurred for direct and indirect activities. Use of this base assumes that costs incurred benefit both direct and indirect objectives and should be allocated to the appropriate cost objective receiving a benefit as determined by the proportional number of hours assigned to that cost objective.

D. Total Cost Input

This base frequently is used to allocate General and Administrative (G&A) costs. The base consists of direct labor, fringe benefits, overhead costs, associated non-salary direct expenses (including other costs sometimes referred to as "internal direct expenses") and subcontract costs.

E. Total Cost Value Added

This base is similar to the Total Cost Input base. However, the Total Cost Value Added base excludes materials (used primarily in production only) and subcontract costs, as distortion in allocations may occur due to a disproportionate amount of subcontract costs or materials in the pool.

F. Consumption/Usage

This method allocates costs to direct or indirect activities on a common unit, usually time or quantity used. For instance, an internal cost pool such as one for computer-aided drafting and design equipment (CADD) costs can be allocated specifically as a direct cost to a project or as an indirect cost based on the number of hours actually incurred.

5.2 – ACCOUNTING FOR UNALLOWABLE COSTS IN ALLOCATION BASES

[References: FAR 31.201-6, CAS 405-40(e)]

FAR 31.201-6 expressly requires engineering consultants to comply with CAS 405 to account for unallowable costs. CAS 405-40(e) provides that all unallowable costs "shall be subject to the same cost accounting principles governing cost allocability as allowable costs."

CAS 405-40(e) further specifies that:

> In circumstances where these unallowable costs normally would be part of a regular indirect-cost allocation base or bases, they shall remain in such base or bases. Where a directly associated cost is part of a category of costs normally included in an indirect-cost pool that will be allocated over a base containing the unallowable cost with which it is associated, such a directly associated cost shall be retained in the indirect-cost pool and be allocated through the regular allocation process.

Note: *Allocation bases contain allowable and unallowable costs, but indirect cost pools must be purged of unallowable costs. Additionally, regardless of whether State DOTs contractually limit the amount of direct labor that may be reimbursed on a contract, the engineering consultant's direct labor base must remain as allocated per the consultant's job cost system, and the direct labor base should not be adjusted for unallowable costs. A direct labor base should not be reduced for any excess compensation adjustments but should have allocated to it the allowable overhead in accordance with FAR 31.203(d), which provides that:*

"Once an appropriate base for allocating indirect costs has been accepted, the contractor shall not fragment the base by removing individual elements. All items properly includable in an indirect cost base shall bear a pro rata share of indirect costs irrespective of their acceptance as Government contract costs. For example, when a cost input base is used for the allocation of G&A costs, the contractor shall include in the base all items that would properly be part of the cost input base, whether allowable or unallowable, and these items shall bear their pro rata share of G&A costs."

EXAMPLE 5-1:

Sample Design Firm incurred $2.5 million in direct labor, of which $500,000 was not billable to contracts. The total $2.5 million must remain in the direct labor base, which will then be used to allocate the allowable indirect costs.

5.3 – COST CENTERS

Cost centers are established to accumulate and segregate costs. Cost centers are developed to capture costs associated with a single purpose. The costs are then assigned to objectives (projects) based on unit charges. For example, unit charges frequently are computed for cost categories such as CADD, printing, computers, and vehicles. The over- or under-allocation of costs usually is handled as an adjustment to the overhead cost pool, which is where the costs would have been charged if they had not been directed to the cost center. However, if the over- or under-allocation is significant, then consideration should be given to adjusting the contract/project charges.

Some accounting systems will attempt to adjust the unit charge rate for the over- or under-allocation of the cost centers. The goal of any cost center is to minimize the over- or under-allocation by the application of a properly estimated unit charge.

Some firms choose not to create cost centers and instead estimate the cost of providing certain services by computing unit rates based on certain elements from general ledger accounts (e.g., automobile depreciation from a depreciation account). Once established, these unit charges are offset to overhead as "credit backs" or cost recoveries for allocated direct costs as they are utilized on projects. This type of costing is less precise and should not be utilized if the unit charges being accumulated are significant to the firm's overall operation. If handled on a direct-cost basis, the direct cost rates must be supported and audited. The burden is on the engineering consultant to prove the direct cost rates and that direct costs

were properly removed from the indirect cost pool. The overhead audit should include disclosure notes regarding the audited direct cost rates and a listing of cost categories that the engineering consultant charges direct. See Chapter 8 for testing guidance and Chapter 9 for disclosure guidance.

Note: *Firms that do create costs centers generally capture costs either by business activity (functional cost centers) or based on the firm's organizational structure, as discussed below.*

A. Functional Cost Centers

This method segregates costs unique to a business activity, typically for purposes of direct costing.

B. Subsidiaries, Affiliates, Divisions, and Geographic Locations

Another method of accumulating and segregating costs is focused on the corporate structure. Some examples of cost centers used for accumulating costs are groupings of regional offices, specific subsidiaries, affiliates, divisions, or field offices.

5.4 – ALLOCATED COSTS

A. Generally

Indirect costs should be accumulated by logical (homogeneous) cost groupings (pools), with due consideration of the reasons for incurring such costs, allocated to cost objectives in reasonable proportion to the beneficial and causal relationship of the pool costs to final cost objective (see FAR 31.203(c)). The auditor should make a thorough study of the indirect cost activity, including activity bases used for allocation and the cost allocated, to determine whether the activity base chosen by the engineering consultant is appropriate for cost allocation and results in a reasonable measure of the activity. The base should:

- be a reasonable measure of the activity;
- be measurable without undue expense, and, except for G&A expense;
- should fluctuate concurrently with the activity that generates the costs.

When an engineering consultant's activities are decentralized, the use of separate indirect cost rates for each geographic location will normally produce more equitable allocation of indirect costs than the use of composite or company-wide rates. Overhead rates determined for offsite/field activities should be based on eliminating from the overhead pool those types of indirect costs which do not benefit offsite activities. For example, occupancy costs may be eliminated from offsite pools because the engineering consultant uses Government facilities.

B. Fringe Benefits

Fringe benefits include costs for employee perquisites and costs associated with the employer's portion of payroll taxes and employment benefits. Such costs generally include, but are not limited to, payroll taxes, pension plan contributions, paid time off, medical insurance costs, life insurance, and certain employee welfare expenses.

C. Overhead

Overhead costs are costs that may benefit, or are associated with, two or more business activities, but are not specifically allocated to an activity for reasons of practicality. Overhead differs from general and administrative costs (below) in that these costs can be associated with a unit based on relative benefit. Some examples of overhead costs include rent, depreciation, employee recruitment and training, and general or professional insurance policy costs.

D. General and Administrative (G&A)

G&A expenses generally comprise all costs associated with business operations that cannot be specifically identified with a smaller unit of business activities. For example, certain management or administration costs that are incurred for an entire business unit may be considered G&A, but other accounting or legal costs benefiting a segment of the business may be considered part of the overhead pool of that specific business segment.

E. Internally-Allocated Costs (Company-Owned Assets)

1. Computer/CADD Costs

Generally, this cost center includes costs such as equipment depreciation or rental; software including license costs; employee training costs on new software; equipment maintenance; cost of special facilities or locations; and systems development labor or support costs.

2. Fleet or Company Vehicles

For the most part, these are costs associated with company vehicles such as cars, survey trucks, and vans that may be used for a direct or indirect cost objective. Costs in this center may include depreciation, lease costs, maintenance, insurance, and operation costs such as fuel.

3. Equipment

Costs accumulated to this center are similar to both computer and company vehicle pools. Company equipment can be a wide variety of items from small to large that are used in various activities. Some examples include nuclear density meters, GPS equipment, and traffic counting machines.

4. Printing/Copying/Plan Reproduction

Costs in this center are generally associated with reproduction from a single page copied to multiple prints of large specialized drawings or blue prints. In most cases, this cost center includes equipment, labor, ink or toner, and paper supplies.

No final cost objective shall have allocated to it as a direct cost any cost, if other costs incurred for the same purpose in like circumstances have been included in any indirect cost pool to be allocated to that or any other final cost objective.

***Note**: The "Like-Cost" Issue.*

FAR 31.202(a) provides that "[n]o final cost objective shall have allocated to it as a direct cost any cost, if other costs incurred for the same purpose in like circumstances have been included in any indirect cost pool to be allocated to that or any other final cost objective."

Like-cost categories should be consistently allocated in the accounting system. As an example, employee personal vehicle mileage must be allocated to similar cost objectives in the same manner as company vehicle mileage. One category of like costs may not be charged directly to contracts while the related like cost category are recovered as part of the indirect cost rate. Other common like cost categories are computers and telephones.

F. Internal Labor Costs

1. Direct Labor

Labor costs are usually the most significant costs incurred by design and engineering firms in the performance of Government contracts. Incurred labor costs form the basis for estimating labor for future contracts. Therefore, it is imperative that engineering consultants establish and maintain a sound system of internal control over the labor charging function.

Unlike other items of cost, labor is not supported by external documentation or physical evidence to provide an independent check or balance. The key link in any sound labor charging system is the individual employee. It is critical to labor charging internal control systems that management fully indoctrinate employees on their independent responsibility for accurately recording time charges. This is the single most important feature management can emphasize in recognizing its responsibility to owners, creditors, and customers to guard against fraud, waste, and significant errors in the labor charging functions.

An adequate labor accounting system, manual or electronic, will create an audit trail whenever an employee creates a timesheet entry. A system that allows an audit trail to be destroyed is inadequate because the integrity of the system can be easily compromised. Access to timesheets should be controlled and preprinted, if possible, with the employee's name, number and fiscal week. An inadequate system would allow employees to erase prior entries without recording the adjustment. Employees should initial all time sheet changes and adjustments should be maintained as part of the audit trail.

The engineering consultant should have procedures to ensure that labor hours are accurately recorded and that any corrections to timekeeping records are documented, including appropriate authorizations and approvals. When evaluating the engineering consultant's timekeeping procedures, the auditor should consider whether the procedures are adequate to maintain the integrity of the timekeeping system.

The engineering consultant should have policies and procedures for training employees to reasonably ensure that all employees are aware of the importance of proper time charging.

Note: *See Chapter 6 for further discussion of Labor-Charging System requirements.*

2. Uncompensated Overtime for Salaried Employees

Engineering consultants may not be required to pay overtime to salaried employees for hours worked in excess of 40 hours per week. Any unpaid hours worked by salaried employees in excess of the normal 40 hours per week are commonly called "uncompensated overtime."

The engineering consultant must have procedures covering the consistent recording and accounting for hours worked, whether paid or unpaid, to ensure the proper distribution of labor costs. This is necessary because labor rates and labor overhead costs can be affected by total hours worked, not just paid hours worked.

Per DCAA CAM Section 6-410.3.d:

> If it is determined that Government contracts are being over charged by a material amount due to an inequitable allocation of costs because the contractor does not record all time worked, the contractor should be cited as being in noncompliance with FAR 31.201-4 and CAS 418. Any material excess allocation of costs to Government contracts should be questioned or disapproved as applicable. Materiality is the governing factor when determining whether noncompliances should be cited and whether a contractor should be required to implement a total-hour accounting system.

For firms with material amounts of uncompensated overtime labor, it is necessary to apply an adjustment to minimize the risk that Government projects will absorb disproportionate amounts of direct labor costs. This may be accomplished through either of the following common methods, or any other equitable method, so long as the method applied is consistent year to year, and the methodology is reasonable and supportable:

1. ***Effective Rate Method.*** Using this method, effective hourly pay rates are computed weekly, based on actual time charges. This would require the client to divide each employee's total weekly salary by their respective hours worked, which would result in variable wage rates being charged to contracts. For example, if Employee Smith is paid $1,400 per week and works 40 hours per week, then Smith's effective hourly wage rate is $35. By contrast, if Smith actually works 55 hours in week 1 and 50 hours in week 2, then his effective wage rates are $25.45 and $28, respectively. Billings against Government contracts would be limited to the effective rates.
2. ***Salary Variance Method.*** Under this method, overhead is reduced for the appropriate portion of labor costs generated by uncompensated overtime hours. The calculation may be completed one of two ways, based on the engineering consultant's use of standard or effective hourly rates. Standard rates are computed as the total paid labor cost compared to total paid hours (e.g., weekly pay divided by 40 hours, or annual pay divided by 2,080 hours).

   (a) Standard Wage Rates: If the engineering consultant records labor at standard rates, then at year end the overhead cost pool must be reduced by the number of uncompensated hours multiplied by the standard wage rate. For example, if Employee Smith earns $72,800, then his standard hourly wage rate is $35.[4] If Smith actually works 2,600 hours during the year, then there are 520 hours of uncompensated overtime.[5] Accordingly, the

[4] $72,800 divided by 2,080 standard hours.

[5] 2,600 actual hours minus 2,080 standard hours.

indirect cost pool must be reduced by $18,200.[6] This example is illustrated below in *Table 5-1*.

Table 5-1: Salary Variance Method – Standard Rate Example

Employee	Direct Hours	Indirect Hours	Hours Worked	Annual Salary	Standard Hourly Rate	Direct Labor	Indirect Labor	Labor Variance	Total Labor
Smith	2,000	600	2,600	$ 72,800	$ 35	$ 70,000	$ 21,000	$ (18,200)	$ 72,800
Ending Direct Labor:			$ 70,000						
Ending Indirect Labor:			$ 2,800	($21,000 - $18,200)					

(b) Effective Wage Rates: If the engineering consultant records labor at effective hourly rates, then at year end the overhead cost pool must be reduced, and the direct labor base must be increased, by the number of direct labor hours multiplied by the difference between the standard and effective hourly rates. For example, if Employee Smith earns $72,800 working 2,600 hours during the year, his effective rate is $28. If 2,000 of Smith's hours were spent on direct projects, the indirect cost pool must be reduced and direct labor base increased by $14,000. This example is illustrated below in *Table 5-2*.

Table 5-2: Salary Variance Method – Effective Rate Example

Employee	Direct Hours	Indirect Hours	Hours Worked	Annual Salary	Standard Hourly Rate	Effective Hourly Rate	Direct Labor	Indirect Labor	Total Labor	Labor Variance
Smith	2,000	600	2,600	$ 72,800	$ 35	$ 28	$ 56,000	$ 16,800	$ 72,800	$ 14,000
Ending Direct Labor:			$ 70,000	($56,000 + $14,000)						
Ending Indirect Labor:			$ 2,800	($16,800 - $14,000)						

As illustrated in Tables 5-1 and 5-2 above, the end result of using the Salary Variance Method is the same regardless of whether the engineering consultant uses the Standard Rate or Effective Rate option.

***Note:** Significant amounts of uncompensated overtime may have a material impact on costs charged directly to State DOT contracts. Accordingly, State DOTs may seek billing adjustments when appropriate.*

Some engineering consultants may have accounting systems that do not capture costs for hours worked by salaried employees in excess of 8 hours per day or 40 hours per week. Because there is a serious risk of incorrect charging of costs to Government contracts under these circumstances, the following methods of distributing these salary costs are unacceptable:

1. Distribute labor costs to only those cost objectives worked on during the first 8 hours of the day.
2. Allow employees to select the cost objectives to be charged when more than 8 hours per day are worked or the engineering consultant has an informal policy as to how employees are to select the objectives to be charged.

3. Overtime Premium

Engineering consultants should have the capability of maintaining records that segregate overtime premium amounts as direct or indirect costs. An acceptable method is to charge the premium portion of overtime as a direct charge when it is the engineering consultant's regularly established policy and when appropriate tests demonstrate that this policy results in equitable cost allocations.

When employees normally work on multiple contracts it is often difficult to determine which contract "caused" the overtime. Therefore, many companies have a policy that the overtime premium portion is allocated to the overhead pool.

[6] $35 per hour standard wage rate multiplied by 520 uncompensated overtime hours.

Note: Engineering consultants may treat overtime premium as either a direct or indirect cost, depending on the specific circumstances; however, consultants must treat overtime premium costs consistently for all contracts, regardless of the customer (Government versus commercial) or type of contract involved.

4. Other Considerations

- ***Approvals and Authorizations.*** The engineering consultant should have procedures to ensure that labor hours are accurately recorded and that any corrections to time keeping records are documented, including appropriate authorizations and approvals.
- ***Reconciliation of Labor System to Payroll and General Ledger.*** The engineering consultant should have procedures requiring that the total labor costs reflected in labor distribution summaries (job cost) agree with the total labor charges as entered in the time-keeping, payroll systems and general ledger. This reconciliation ensures the labor charges to contracts represent actual paid or accrued costs and that such costs are appropriately recorded in the accounting records.
- ***Reconciliation of General Ledger and Overhead Schedule to Payroll Tax Returns (IRS Form 941s).*** The engineering consultant should have procedures requiring that the total labor costs recorded in the general ledger, and included on the overhead schedule, reconcile to the payroll data submitted to the Internal Revenue Service.
- ***Labor Costs Directly Associated with Unallowable Activities.*** The engineering consultant should have procedures requiring that direct and indirect labor costs directly associated with unallowable costs are identified and segregated.

5. Potential Areas of Risk Regarding Internal Labor

- ***Overrun Contracts.*** When contract costs have exceeded or are projected to exceed contract value, these excess costs should not be diverted to other cost objectives such as indirect labor, overhead accounts, or other contracts.
- ***Significant Increases in Direct/Indirect Labor Accounts.*** Trend analyses may disclose instances where charges to direct or indirect labor accounts have increased significantly. Two common ratios often used for trend analysis are the *Productivity Ratio* (direct labor/total labor) and the *Multiplier Ratio* (fee revenue/direct labor). Sufficient review should be performed to determine the nature of any significant increase or variance from prior years.
- ***Reorganization/Reclassification of Employees.*** The organizational structure of the engineering consultant should be analyzed to determine if it permits inconsistent treatment of similar labor. For example, a program manager should not charge direct on cost-type contracts and indirect on fixed-price/ commercial contracts.
- ***Adjusting Journal Entries/Exception Reports (Labor Transfers).*** Adequate rationale and supporting documentation should be available for all significant labor transfers.
- ***Budgetary Control.*** Engineering consultants may operate management systems that require strict adherence to budgetary controls. If the system is inflexible, then labor charges may tend to follow the identical route of the budgeted amounts. Rigid budgetary control systems can result in predetermined labor charges.
- ***Mix of Contracts.*** Costs should be identified and charged consistently in the accounting system, regardless of contract type. Significantly higher inherent risk exists for firms that use combinations of lump sum contracts and cost plus fixed fee contracts. The risk is that direct labor and other direct costs may not be accounted for under the correct cost objective, thereby resulting in understatement of direct labor and overstatement of indirect labor or incorrect direct project charging. Also see the discussion in Chapter 9–General Audit Considerations.

6. Sole Proprietors' and Partners' Salaries

The compensation of owners or partners must be charged as direct labor when they are personally engaged in performing tasks under contracts. If sole proprietors or partners do not receive a salary, then

their compensation must be determined by advance agreements or negotiation.

G. Contract Labor/ Purchased Labor

[Reference: CAS 418]

In some cases, engineering consultants contract for services provided by outside engineers, technicians, and similar staff rather than hiring these individuals as employees. This is commonly referred to as "Contract or Purchased Labor." The accounting treatment varies, depending on the circumstances under which the purchased labor costs are incurred.

Two acceptable methods of accounting for this labor are:

1. Charged as a direct cost to projects, or
2. Treated as other labor (direct or indirect as appropriate)

CAS 418 requires that pooled costs be allocated to cost objectives in reasonable proportion to the causal or beneficial relationship of the pooled costs to cost objectives. Contract labor must share in an allocation of indirect expenses where such a relationship exists and the allocation method is consistent with the engineering consultant's disclosed accounting practices. A separate allocation base for purchased labor may be necessary to allocate significant costs to contract labor, such as supervision and occupancy costs, or to eliminate other costs, such as fringe benefits, that do not benefit purchased labor.

5.5 – Other Direct Costs-Outside Vendors/Employee Expense Reports

Other Direct Costs (ODCs) typically include subcontracts, travel, and outside printing. Internally allocated costs based on charge-out rates developed by the firm, such as company vehicle mileage and copying, are earlier in this chapter.

Note: *To be treated as a direct cost, the item must have been required for, and used exclusively on, a specific job. The "but-for" principle should apply. "But for this job, the cost would not have been incurred." All similar costs must also be treated as direct costs and excluded from overhead costs.*

The audit procedures for ODCs involve determining if unallowable costs were handled correctly. Per CAS 405-40 (Fundamental Requirement): "All unallowable costs shall be subject to the same cost accounting principles governing cost allocability as allowable costs. If a direct cost is unallowable, then it must remain allocated as a direct cost and may not be included in any indirect cost pool.

5.6 – Field Office Rates

[Reference: FAR 31.203(f)]

A. Generally

Engineering consultants are not always able to perform contracted services from their established home- or branch offices, as certain contracts may require establishment of offices in field locations, or the engineering consultant may be required to locate personnel in office space provided by a State DOT. Some engineering consultants may even establish a separate company for field projects. Engineering consultants may have both field (construction management) and project (design) office rates. Both rates may be required or established by contract if the consultant did not have previously established field rate accounting.

Per FAR 31.203(f): "Separate cost groupings for costs allocable to offsite locations may be necessary to permit equitable distribution of costs on the basis of the benefits accruing to the several cost objectives." In some cases, projects involve engineering consultants working in State DOT provided office(s) for an extended period of time. The life of the field office is basically determined by the project.

For projects where the engineering consultant's employees do not work out of their own offices and do not receive office support in their day-to-day activities, the hours billed for them may not qualify for the engineering consultant's full overhead rate. The purpose of the field rate is to pay the engineering consultant for the fringe benefits, project employee management, and home office administrative support they do provide to their field employees.

Approved costs directly identified with the project and consistently treated, as direct costs in the engineering consultant's accounting records will be allowed as direct project costs.

Note: *Field offices may exist in several forms. Regardless of the engineering consultant's organization, consistency in allocating costs to cost objectives is critical. This Guide presents several suggested methods for computing field office rates. The use of alternative methods may be acceptable. The use of all methodologies must be supported by notes to the overhead schedule or in a separate disclosure statement.*

B. Types of Field Offices

There are many situations that may require the development of a field- or project-office rate. For example:

- ***Construction Contract Administration/Construction Inspection (Field Office).*** These contracts involve the management of construction projects and often involve the engineering consultant's personnel being located in an on-site project trailer provided by the contractor or the State DOT. For larger, "mega" projects, the engineering consultant's personnel may be located in the State DOT's main or regional office.
- ***Project Office.*** These contracts usually involve services such as design, real estate, traffic center operations, and utilities. When working on these types of contracts, the engineering consultant's personnel typically work out of an office provide by the State DOT.
- ***"On Call" Engineers.*** Consultants with on-call service contracts for short-term projects and tasks may be required by contract to apply a field rate if the consultant is located in a State DOT's offices.
- ***Contract Employees.*** State DOTs contract with engineering consultants to provide administrative functions and the engineering consultant's personnel are located in the State DOT's offices to perform these functions.

C. Cost Accounting Considerations

Engineering consultants must be consistent in the development and application of field rates. Accordingly, if an engineering consultant has computed a field rate, this rate must be consistently applied across all business segments and disciplines.

Field rate accounting has an impact on the home office rate. If an engineering consultant has an established field rate for a particular project or State DOT, then the engineering consultant's home office rate will be higher than if the consultant had only a single company-wide rate. As such, for consistent cost accounting application, a State DOT that does not have a field office project would have a higher home rate applied to their State DOT projects.

1. Field Office Direct Labor

Direct field labor is based on actual labor hours multiplied by actual labor rates for field assigned employees. If historical data is not available when establishing a provisional field rate for the first time, then an estimate of direct hours for the contract(s) may be used to distribute direct labor to the field office overhead pool and/or a provisional rate may be negotiated.

2. Field Office Indirect Costs

There are many considerations to use when developing methodologies for field and project office rates, and these may vary between engineering consultants. However, direct labor is the common base used in the development of field rates. The following method described for allocating costs is a preferred methodology. Field- and project-office rate calculations based on different methodologies than what is provided in this Guide may be acceptable. Many firms disclose their methodology in their audit footnotes or have an approved Cost Allocation Disclosure Statement that documents their field office accounting methodology.

If an alternative allocation method is used, then the consultant's allocation must have resulted from a "reasonable and determinable allocation plan, consistently applied." The engineering consultant should provide a note or other disclosure to describe the allocation methodology in sufficient detail so an auditor can examine the methodology and verify its logic and reasonableness.

As a general rule, State DOTs do not require extensive administrative staffing of engineering consultants' field offices. Most administrative and management functions will be performed in the home or branch office. Therefore, an equitable portion of these offices' indirect costs should be allocated to the field office. The costs that are allocated, and the basis for the allocation, depend largely on the engineering consultant's customary accounting practices. Some State DOTs require separate cost pools for accumulation of field office costs. Certain home office indirect cost should be fully allocated to the home office overhead pool, and certain field office indirect cost should be fully allocated to the field office pool (see further discussion in Section 5.6.C.3).

Fringe Benefits. The fringe benefits applicable to the field office direct labor costs should be allocated to the field office overhead pool. If the engineering consultant's accounting records do not maintain separate accounts for field office fringe benefits, then the fringe benefits may be allocated using the Field Office Direct Labor Rate shown below in Table 5-3:

TABLE 5-3: COMPUTATION OF FIELD OFFICE DIRECT LABOR RATE

$$\frac{\text{Field Direct Labor Cost}}{\text{Total Direct Labor Cost}} = \text{Field Office Direct Labor Rate}$$

Indirect Labor–Non Project Time. Labor costs pertaining to non- project time of professional staff working in the field office (training, staff development, staff meetings, and/or similar activities) is generally recorded specifically within the Field Office Indirect Labor accounts. If these costs are not identified or accounted for separately, then a ratio based on the Field Office Labor Rate may be used to allocate costs to the Field Offices, as shown below in Table 5-4:

TABLE 5-4: COMPUTATION OF FIELD OFFICE LABOR RATE

$$\frac{\text{Total Field Labor Cost}}{\text{Total Labor Cost}} = \text{Field Office Labor Rate}$$

Indirect Labor—Support Staff. Indirect salaries, such as accounting, legal, purchasing, personnel, management, and/or similar costs, should also be allocated to the field office overhead pool. Project managers who spend significant amounts of time managing field office staff may account for this management time as actual indirect in the field office overhead pool. This actual time must be supported and documented on the managers' time report. All other support staff time that is not specifically accounted for may be allocated between the home office overhead pool and the field office overhead pool. A ratio of Field Office Labor Percentage would be a reasonable method to allocate these costs.

3. Other Considerations Regarding Indirect Cost Allocations

Indirect Costs Fully Allocated to Home Office. Certain home office indirect costs should be fully allocated to the home office overhead cost pool. These costs include, for example, depreciation, facilities rent, real estate taxes, facility maintenance and repairs, utilities, facility insurance, and/or similar types of costs associated with home office direct labor. (Costs of support functions that support both home and field offices should be allocated accordingly.)

Indirect Costs Fully Allocated to Field Office. Likewise, certain field office indirect costs should be fully allocated to the field office overhead pool. Some examples of these costs include field equipment, on-site trailer rental, field supplies, field equipment, software specific to projects, and/or similar types of costs.

Indirect Costs Ratably Allocated to Field Office. Other general indirect costs are allocated to the field office overhead pool based on a reasonable estimate of the benefits accruing to the field office pool. One recommended method is to allocate general indirect costs on the basis of the field office labor percentage. This allocation method involves applying the field office labor percentage to the various general expense line items on the company's overhead schedule. Costs such as rent, real estate taxes, facility maintenance and repairs, utilities, facility insurance, and/or other similar costs should be allocated between the G&A portion of the home office costs and to the field offices on a basis that appropriately reflects the benefits received. For example, the space costs for accounting staff and other support services benefit all offices, including field offices; therefore, these costs should be allocated proportionately among the home and field offices.

Separate Accounting for General and Administrative (G&A) Costs. Some engineering consultants account for G&A office costs in a separate cost pool. In this situation, G&A costs may be allocated to both field and home office operations. When G&A costs are allocated on a base other than direct labor cost, then the G&A allocation rate must be separately disclosed on the overhead schedule.

Note: *If the engineering consultant computes a field office overhead rate, then this must be disclosed on the overhead schedule. The schedule should include a separate column listing the indirect field expenses, direct field labor, and resulting field rate. The schedule also should include a footnote to describe the allocation method(s) used. Tables 5-6 and 5-7 show examples of an overhead schedule with a field office rate and supporting computations (see the following pages).*

TABLE 5-5: SAMPLE OVERHEAD SCHEDULE

SAMPLE CONSULTING COMPANY, Inc.
Statement of Direct Labor, Fringe Benefits, and General Overhead
For the Year Ended December 31, 201x

Account Number & Description	General Ledger Account Balance	Direct Costs	Disallowed Costs	Proposed Company Wide	% of Direct Labor
DIRECT LABOR	$ 1,950,501	$ 1,950,501	$ -	$ 1,950,501	100.00%
INDIRECT COSTS:					
FRINGE BENEFITS					
6300 Benefits: Bonuses	$ 234,060	$ -	$ (28,560) (a)	$ 205,500	10.54%
6310 Benefits: 401(k)	97,525	-	-	97,525	5.00%
6320 Benefits: PTO (vac., sick, and holiday)	253,565	-	-	253,565	13.00%
6820 Insurance: Disability	58,515	-	-	58,515	3.00%
6830 Insurance: Life	21,846	-	(800) (b)	21,046	1.08%
6840 Insurance: Medical	136,535	-	-	136,535	7.00%
6850 Insurance: Workers' Comp	15,799	-	-	15,799	0.81%
7500 Payroll Taxes: FICA and Med	180,421	-	-	180,421	9.25%
7510 Payroll Taxes: FUTA and SUTA	78,020	-	-	78,020	4.00%
TOTAL FRINGE BENEFITS	$ 1,076,286	$ -	$ (29,360)	$ 1,046,926	53.67%
GENERAL OVERHEAD					
6700 Indirect Labor	$ 741,190	$ -	$ (3,300) (c)	$ 737,890	37.83%
5010 Direct: Lodging, Meals, and Travel	122,101	(122,101)	- (d)	-	0.00%
5020 Direct: Employee Mileage Reimbursements	159,941	(159,941)	- (d)	-	0.00%
5030 Direct: Rentals and Supplies	21,651	(21,651)	- (d)	-	0.00%
5040 Direct: Subconsultants	44,862	(44,862)	- (d)	-	0.00%
6000 Advertising and Marketing	23,991	-	(6,750) (e)	17,241	0.88%
6100 Automobile Expense	68,268	-	(13,580) (f)	54,688	2.80%
6200 Bank Service Charges	9,753	-	-	9,753	0.50%
6400 Contributions and Gifts	14,629	-	(14,629) (g)	-	0.00%
6500 Depreciation Expense	117,030	-	-	117,030	6.00%
6600 Dues and Subscriptions	16,189	-	(350) (h)	15,839	0.81%
6800 Insurance: Automotive	15,409	-	-	15,409	0.79%
6810 Insurance: Business Liability	23,406	-	-	23,406	1.20%
6900 Interest Expense	36,084	-	(36,084) (i)	-	0.00%
7000 Licenses and Permits	21,456	-	-	21,456	1.10%
7100 Maintenance and Repairs	97,135	-	-	97,135	4.98%
7200 Meals & Entertainment	19,310	-	(1,050) (j)	18,260	0.94%
7300 Misc. Fees, Fines, Penalties	6,827	-	(6,827) (k)	-	0.00%
7400 Office Expense: Cleaning	8,192	-	-	8,192	0.42%
7410 Office Expense: Postage and Delivery	4,486	-	-	4,486	0.23%
7420 Office Expense: Office Supplies	32,183	-	-	32,183	1.65%
7430 Office Expense: Other Office Expense	35,889	-	-	35,889	1.84%
7600 Personal Property Tax	42,911	-	-	42,911	2.20%
7700 Prof Fees: Accounting and Legal	30,428	-	-	30,428	1.56%
7800 Rent	180,049	-	(2,400) (l)	177,649	9.11%
7900 Telephone	60,466	-	-	60,466	3.10%
8000 Utilities	29,472	-	-	29,472	1.51%
Credit for Internal Allocations	-	-	(107,278) (m)	(107,278)	-5.50%
TOTAL GENERAL OVERHEAD	$ 1,983,306	$ (348,555)	$ (192,247)	$ 1,442,505	73.96%
TOTAL INDIRECT COSTS & OVERHEAD RATE	$ 3,059,593	$ (348,555)	$ (221,607)	$ 2,489,431	**127.63%**

FAR References and Notes:

(a) 31.205-6(a)(6)(ii)(B): Owners' compensation in excess of reasonable amount is disallowed (distribution of profits).
(b) 31.205-19(e)(2)(v): Officers' life insurance is disallowed.
(c) 31.201-6(e)(2): Marketing, lobbying, and any labor associated with unallowable activities is disallowed.
(d) 31.202: Excluded direct project costs (both billable & non-billable costs) from indirect cost pool.
(e) 31.205-1: Costs for general marketing materials are disallowed.
(f) 31.205-6(m)(2) & 31.205-46(d): Personal use of a company asset (automobile) is disallowed.
(g) 31.205-8 & 31.205-13(b): Contributions and gifts are disallowed.
(h) 31.205-22: Lobbying costs, paid as a percentage of professional dues, are disallowed.
(i) 31.205-20: Interest is disallowed.
(j) 31.205-14 & 31.205-51: Costs for entertainment and alcoholic beverages are disallowed. (The entertainment cost principle supersedes all others.)
(k) 31.201-4, 31.205-15, & 31.205-20: Disallowed late fees; Government-imposed fines and penalties; and credit card interest.
(l) 31.205-36(b)(3): Related-party rent (not an arm's-length transaction) is limited to actual cost of ownership, net of interest and other unallowable items.
(m) 31.202: Direct costs segregated and removed from indirect cost pool.

TABLE 5-6: SAMPLE OVERHEAD SCHEDULE (WITH FIELD RATE)

SAMPLE CONSULTING COMPANY, Inc.
Statement of Direct Labor, Fringe Benefits, and General Overhead (with Field Rate)
For the Year Ended December 31, 201x

Account Number & Description	General Ledger Account Balance	Direct Costs	Disallowed Costs	Proposed Company Wide	ALLOCATIONS Proposed Home Office	ALLOCATIONS Proposed Field Office	Percent to Field Office
DIRECT LABOR	$ 1,950,501	$ 1,950,501	$ -	$ 1,950,501	$ 1,826,853	$ 123,648 (n)	6.34%
INDIRECT COSTS:							
FRINGE BENEFITS							
6300 Benefits: Bonuses	$ 234,060	$ -	$ (28,560) (a)	$ 205,500	$ 193,000	$ 12,500 (n)	
6310 Benefits: 401(k)	97,525	-	-	97,525	91,255	6,270 (n)	
6320 Benefits: PTO (vac., sick, and holiday)	253,565	-	-	253,565	241,421	12,144 (n)	
6820 Insurance: Disability	58,515	-	-	58,515	54,806	3,709	6.34%
6830 Insurance: Life	21,846	-	(800) (b)	21,046	19,711	1,334	6.34%
6840 Insurance: Medical	136,535	-	-	136,535	127,880	8,655	6.34%
6850 Insurance: Workers' Comp.	15,799	-	-	15,799	14,798	1,002	6.34%
7500 Payroll Taxes: FICA and Med.	180,421	-	-	180,421	168,984	11,437	6.34%
7510 Payroll Taxes: FUTA and SUTA	78,020	-	-	78,020	73,074	4,946	6.34%
TOTAL FRINGE BENEFITS	$ 1,076,286	$ -	$ (29,360)	$ 1,046,926	$ 984,928	$ 61,998	
GENERAL OVERHEAD							
6700 Indirect Labor (G&A and support allocation)	$ 741,190	$ -	$ (3,300) (c)	$ 737,890	$ 680,506	$ 38,736 (o)	5.25%
6700 Indirect Labor (field labor allocation)	-	-	-	-	-	18,648 (n)	
5010 Direct: Lodging, Meals, and Travel	122,101	(122,101)	- (d)	-	-	-	5.25%
5020 Direct: Employee Mileage Reimbursements	159,941	(159,941)	- (d)	-	-	-	5.25%
5030 Direct: Rentals and Supplies	21,651	(21,651)	- (d)	-	-	-	5.25%
5040 Direct: Subconsultants	44,862	(44,862)	- (d)	-	-	-	5.25%
6000 Advertising and Marketing	23,991	-	(6,750) (e)	17,241	16,336	905	5.25%
6100 Automobile Expense	68,268	-	(13,580) (f)	54,688	51,817	2,871	5.25%
6200 Bank Service Charges	9,753	-	-	9,753	9,241	512	5.25%
6400 Contributions and Gifts	14,629	-	(14,629) (g)	-	-	-	5.25%
6500 Depreciation Expense	117,030	-	-	117,030	117,030	- (p)	
6600 Dues and Subscriptions	16,189	-	(350) (h)	15,839	15,008	831	5.25%
6800 Insurance: Automotive	15,409	-	-	15,409	14,600	809	5.25%
6810 Insurance: Business Liability	23,406	-	-	23,406	22,177	1,229	5.25%
6900 Interest Expense	36,084	-	(36,084) (i)	-	-	-	5.25%
7000 Licenses and Permits	21,456	-	-	21,456	20,329	1,126	5.25%
7100 Maintenance and Repairs	97,135	-	-	97,135	92,036	5,099	5.25%
7200 Meals & Entertainment	19,310	-	(1,050) (j)	18,260	17,301	959	5.25%
7300 Misc. Fees, Fines, Penalties	6,827	-	(6,827) (k)	-	-	-	5.25%
7400 Office Expense: Cleaning	8,192	-	-	8,192	8,192	- (p)	
7410 Office Expense: Postage and Delivery	4,486	-	-	4,486	4,486	- (p)	
7420 Office Expense: Office Supplies	32,183	-	-	32,183	32,183	- (p)	
7430 Office Expense: Other Office Expense	35,889	-	-	35,889	35,889	- (p)	
7600 Personal Property Tax	42,911	-	-	42,911	42,911	- (p)	
7700 Prof Fees: Accounting and Legal	30,428	-	-	30,428	28,830	1,597	5.25%
7800 Rent	180,049	-	(2,400) (l)	177,649	177,649	- (p)	
7900 Telephone	60,466	-	-	60,466	57,291	3,174	5.25%
8000 Utilities	29,472	-	-	29,472	29,472	- (p)	
Credit for Internal Allocations	-	-	(107,278) (m)	(107,278)	(107,278)	- (p)	
TOTAL GENERAL OVERHEAD	$ 1,983,306	$ (348,555)	$ (192,247)	$ 1,442,505	$ 1,366,008	$ 76,497	
TOTAL INDIRECT COSTS	$ 3,059,593	$ (348,555)	$ (221,607)	$ 2,489,431	$ 2,350,936	$ 138,495	
OVERHEAD RATES (as percentages of direct labor cost)				**127.63%** Company Wide	**128.69%** Home Office	**112.01%** Field Office	

FAR References and Notes:

(a) 31.205-6(a)(6)(ii)(B): Owners' compensation in excess of reasonable amount is disallowed (distribution of profits).
(b) 31.205-19(e)(2)(v): Officers' life insurance is disallowed.
(c) 31.201-6(e)(2): Marketing, lobbying, and any labor associated with unallowable activities is disallowed.
(d) 31.202: Excluded direct project costs (both billable & non-billable costs) from indirect cost pool.
(e) 31.205-1: Costs for general marketing materials are disallowed.
(f) 31.205-6(m)(2) & 31.205-46(d): Personal use of a company asset (automobile) is disallowed.
(g) 31.205-8 & 31.205-13(b): Contributions and gifts are disallowed.
(h) 31.205-22: Lobbying costs, paid as a percentage of professional dues, are disallowed.
(i) 31.205-20: Interest is disallowed.
(j) 31.205-14 & 31.205-51: Costs for entertainment and alcoholic beverages are disallowed. (The entertainment cost principle supersedes all others.)
(k) 31.201-4, 31.205-15, & 31.205-20: Disallowed late fees; Government-imposed fines and penalties; and credit card interest.
(l) 31.205-36(b)(3): Related-party rent (not an arm's-length transaction) is limited to actual cost of ownership, net of interest and other unallowable items.
(m) 31.202: Direct costs segregated and removed from indirect cost pool.
(n) Field employee labor and fringe specifically identified.
(o) Indirect general administrative and support labor less identified field portion is allocated.
(p) Accounts specifically identified as home office only.

TABLE 5-7: FIELD OFFICE COMPUTATIONS

Field Employee Worksheet

Employee Name & Classification	Direct Labor	Indirect Labor (general)	Bonuses (fringe benefit)	401(k) (fringe benefit)	Paid Time Off (fringe benefit)	Field-Specific Totals
Name 1 - Project Manager	-	10,920	-	-	-	10,920
Name 2 - Senior Engineer	50,176	3,136	7,500	2,620	4,928	68,360
Name 2 - Project Engineer	41,216	2,576	3,500	1,966	4,048	53,306
Name 4 - Technician 1	32,256	2,016	1,500	1,685	3,168	40,625
	123,648	18,648	12,500	6,270	12,144	173,210

Field Office Direct Labor Calculation

Direct Labor (Field Office)	123,648
	÷
Total Direct Labor (Home + Field)	1,950,501
Direct Labor Based Field %	6.34%

Field Office Labor Calculation

	Company Wide	Field Office
Direct Labor	1,950,501	123,648
PTO (vacation/sick/holiday)	253,565	12,144
Indirect Labor	737,890	18,648
Totals	2,941,957	154,440
		÷
Total Company Labor		2,941,957
General Overhead Field %		5.25%

NEBRASKA DEPARTMENT OF ROADS - OPERATIONAL ANALYSIS AND AUDIT DIVISION

PRE-AWARD AUDIT PROGRAM FOR EVALUATING CONSULTING ENGINEERING FIRM'S PROPOSED SALARY AND OVERHEAD RATES

* * * * * * * *

PURPOSE

The purpose of this audit is to provide the requesting party with information about the basis of the Consultant's proposed salary rates, and whether the proposed overhead rate is acceptable for negotiation purposes.
This audit program should not be considered an inflexible checklist describing in minute detail how every phase of the audit will be accomplished. Rather, it should serve as a general guide to the accomplishment of the audit.

SCOPE

To the extent practical, we will follow the Government Auditing Standards. You may place reliance on telephone conversations with Company officials, audits by other federal, state or local governments or independent accounting firms, photocopies of accounting records and reports, and past audit experience.

AUDIT REVIEW STEPS

Each step should be cross-referenced to applicable review workpapers.

Workpaper Reference

A. EVALUATION OF SALARY RATES

1. Verify arithmetic accuracy, if applicable.
2. If names are not listed, contact the requesting party to determine if they need names and individual's rates. Take action accordingly.
3. Contact the Consultant to establish basis of rates.
   a. If rates are current actual rates, no further review is needed. If not, determine what adjustments were made, if possible obtain current actual rates, and verify the adjustment computations. Your audit report should indicate the nature of the adjustments.

B. EVALUATION OF OVERHEAD RATE

The general overhead rate formula is:

Allowable Overhead Costs divided by Direct Payroll Cost

Normally we use prior year's actual costs rather than budget projections. Cost principles are the Federal Acquistion Regulations, 48 CFR, 1-31.2, Contracts with Commercial Organizations.

1. Determine if actual costs were used and the cost period was proper.
2. Determine if you can place reliance on audits by NDOR or others.
3. If further review is needed, obtain rate computation figures.
   a. Review for arithmetic accuracy.
   b. Compare with past years. Determine reasonableness of variances.
   c. Eliminate unallowable costs per 48 CFR 1-31.2:
      1. Advertising and Publicity 31.205-1
      2. Bad Debts and related Legal Fees 31.205-3
      3. Personal use of Company Vehicles 31.205-6
      4. Contributions 31.205-8
      5. Entertainment 31.205-14
      6. Fines and penalties 31.205-15
      7. Interest 31.205-20
      8. Losses on other Contracts 31.205-23
      9. Organizational Costs 31.205-27
      10. Federal Income Tax 31-205-41
      11. Non-business, Non-Professional Dues & Subscriptions 31.205-43
      12. Alcoholic Beverage Costs 31.205-51.
   d. Eliminate direct non-labor expenses.
   e. Analyze reasonableness of bonuses and incentives 31.205-6(f).
   f. Ensure that if charges for rent, leases, etc. are paid to organizations in which the firm or its principals' have a controlling interest, that they do not exceed normal costs of ownership 31.205-36(b)(3).
   g. Determine reasonableness of direct and indirect labor amounts.
   h. Compute the acceptable overhead rate as needed.

C. AUDIT REPORT

1. Prepare a written report. Identify the basis of the proposed salary rates, and the accepted overhead rate. Provide details as needed.

Project No. _____
Consultant _____
Auditors Initials _____ Date _____

CALCULATING OVERHEAD AND PRICE

Alan Hauff, pricing expert and small business specialist for University Outreach and Extension at the University of Missouri-St. Louis, has devised a seven-step process for calculating the all-important overhead percentage, which is shown in Fig. I-I on the following page. After the overhead percentage is determined, important pricing decisions can be made.

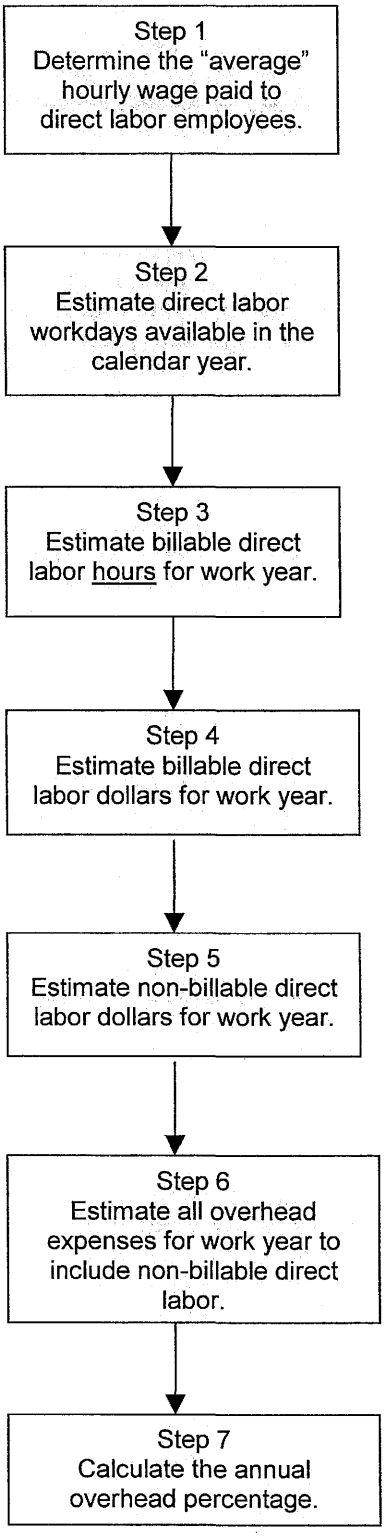
To calculate overhead percentage, several terms must be defined. These are found in Table I-I. For instance, an overhead percentage of 220% means that for every $1.00 of direct labor billed to the customer, the business must collect an additional $2.20 ($1.00 x 220%) from that customer just to cover its cost of doing business. Thus, if a job required a direct labor wage of $8.50 per man-hour, overhead of $18.70 ($8.50 x 220%) must be added, thus totaling a direct labor cost of $27.20 per man-hour. It is at this point that many business owners are shocked to discover the large difference between the total direct labor wage and the direct labor cost.

TABLE I-I. PRICING-RELATED TERMS.

TERM	DEFINITION
Business Expenses	All expenses found on the company's income statement (also known as the profit and loss statement).
Overhead Expenses	All costs found on the income statement except for direct labor, direct materials, and costs attributable to outside subcontractors that can be billed directly to a customer's account. Overhead expenses are absorbed by the business and factored into the selling price as a percentage of the direct labor cost. They include indirect costs such as accounting, advertising, depreciation, indirect labor, insurance, interest, legal fees, rent, repairs, supplies, taxes, telephone, travel, and utilities.
Direct Labor	Labor used to produce products and services purchased by customers. These man-hours are directly attributable to customer activity.
Indirect Labor	Labor used to provide supporting services to the business such as accounting, clerical, custodial, customer services, management, purchasing, sales, and warehousing. These man-hours support business functions that are not directly chargeable to the customer.
Direct Materials	Materials used in the final product or service purchased by customers. These materials are charged directly to the customer's account.
Overhead Percentage	Ratio between direct labor and overhead expenses. This percentage is used to allocate overhead expenses proportionately to direct labor dollars billed to customers.

Source: Mildred S Pozner and Catherine M. Frank, *Industry at a Glance Report: Manufacturing Job Shops,* University of Missouri-Rolla, SBRI Center, 1999, 80-82.

FIG. I-I. PROCESS FOR CALCULATING OVERHEAD PERCENTAGE,



1. Classify each employee's contribution, or portion thereof, as either direct or indirect labor. Determine the hourly wage rate paid to each direct labor employee and include the business owner, if applicable. Total the hourly wage rates and divide by the number of people counted.

2. Calculate the number of direct labor workdays in a calendar year by subtracting the average number of days that direct labor employees will not be present for work because of weekends, holidays, vacations, and miscellaneous (injury, personal illness, etc.). Count only direct labor employees. Do not include any indirect labor employees in the estimate.

3. Multiply available direct labor workdays by the scheduled 8-hour workday minus the average number of daily non-billable direct labor hours. Non-billable direct labor hours include lunches, breaks, company meetings, training, cleanup, etc., that a customer will not be charged for directly.

4. Multiply billable direct labor hours by average direct labor wage.

5. Subtract billable hours from the total man-hours available in a work year, which is 2088 hours. The remainder equals the non-billable direct labor hours. Multiply this number by the average direct labor rate to arrive at the non-billable direct labor dollars. Non-billable direct labor dollars are absorbed by the company and must be passed on to the customer through the overhead percentage.

6. Refer to the actual or pro forma income statement and total all the business expenses shown for the year. Deduct the cost of billable direct labor, direct materials, and costs attributable to outside subcontractors that will be billed directly to a customer's account. Do not deduct the cost of non-billable direct labor. Adjust the overhead expenses for yearly inflation and projected price changes by multiplying the total by the anticipated percentage increase.

7. Divide the yearly overhead expenses (step 6) by the yearly billable direct labor dollars (step 4), and convert this ratio to a percentage.

Job shop owners are often shocked to learn the magnitude of their overhead, but including overhead in the prices a firm charges for its products and services is essential for the firm's survival and profitability. After the overhead percentage has been calculated, a business owner can examine the possibilities for making changes in the business that will yield desired results, such as lowering overhead in targeted areas, raising prices, decreasing production times, etc.

Pricing Services

To calculate the price for a job shop service, the firm must set the desired percentage gross margin on selling price. (Gross margin on selling price is the preferred method for adding profit to a product or service because it matches the reporting done in income statements where sales revenue is recorded.) Thus, the price a shop should sell its services for is calculated by:

	Avg. Direct Labor Rate	(in $/man-hour; from Step 1)
+	Overhead Rate	(Avg. Direct Labor Rate x Overhead % [Step 7]; in $/man-hour)
	Direct Labor Cost	(in $/man-hour)

For a desired gross margin on selling price of *x*%, convert *x*% to a decimal and calculate the price:

Direct Labor Cost ÷ (100 – *x*) = Charging Rate per man-hour

Example:

Smith's Welding Shop has determined its average direct labor rate to be $15.00/man-hour. It has calculated that its overhead percentage is 200%. It now wants to make a 15% gross margin on selling price. The price Smith's Welding Shop must charge for its services is found by:

	$15.00/man-hour	Avg. Direct Labor Rate
+	$30.00/man-hour	Avg. Direct Labor Rate x Overhead Percentage
	$45.00/man-hour	Direct Labor Cost

For a 15% gross margin on selling price,

$45.00 ÷ (.85) = $52.95/man-hour

Smith's Welding Shop must ask $52.95 per man-hour for its services to make the desired profit margin.

Pricing Products

A similar method to pricing services is used to establish product prices. Calculate the cost of producing one item or unit and use the gross margin on selling price method shown in the service example above to find selling price.

Example:

If Smith's Welding Shop makes and sells a specific type of widget in addition to providing services, it would need to find the cost of producing one widget before it could set a price for the product. Both direct material costs *and* direct labor costs must be included in the price calculations. If production time for one widget is 10 minutes and each widget uses $0.84 in materials:

$45.00/man-hour ÷ 60 minutes = $0.75/minute

$0.75/minute x 10 minutes/widget =		$7.50	direct labor cost per widget
	+	$0.84	direct material costs per widget
		$8.34	cost to produce one widget

For a 15% gross margin on selling price,

$8.34 ÷ (.85) = $9.82 selling price for each widget