Arizona Benchmarking Study

May 2006

VANR Construction Management, Inc.

Arizona Benchmarking Study

PROJECT DELIVERY PERFORMANCE COSTS BENCHMARKING STUDY

May 2006

TABLE OF CONTENTS

Chapter 1 – Executive Summary		**1**
A.	**Background**	**2**
B.	**Introduction**	**2**
C.	**Study Methodology**	**3**
D.	**Conclusion of Performance Benchmarking**	**3**
E.	**Best Management Practices**	**4**
Chapter 2 – Introduction		**6**
A.	**Approach**	**7**
B.	**Performance Benchmarking**	**10**
Chapter 3 – Performance Benchmarking		**11**
A.	**Guiding Principles**	**12**
B.	**Data Collection**	**12**
C.	**Performance Graphs Development**	**12**
D.	**Uses of Graphed Data**	**13**
E.	**Coefficient of Determination**	**13**
F.	**Best Management Practices**	**13**
G.	**Projects Data**	**14**
H.	**Summary Performance Models**	**14**

LIST OF TABLES

Table 2-1	**Projects Distribution Matrix and Project Delivery Percentage Summary**	**15**
Table 2-2	**Sample Questionnaire**	**16**
Table 3-1	**Performance Curves**	**17**
	a. Municipal Facilities	
	b. Streets	
	c. Parks	
	d. Pipes and Plants	
Table 3-2	**BMP Survey**	**23**
Table 3-3	**BMP Survey Results**	**25**
Table 3-4	**Summary of Performance Models**	**26**

Chapter 1
EXECUTIVE SUMMARY

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A. Background

The Pima County, Arizona, Public Works Policy Group initiated this Benchmarking Study in the spring of 2005 based on a similar effort by the City of Los Angeles and the six other largest cities in California (*California Muliti-Agency CIP Benchmarking Study 2002-2005*). The California Study collected and analyzed project delivery costs as a percentage of construction costs and also identified Best Management Practices (BMP's) that would improve and reduce the cost of project delivery.

The Arizona Benchmarking Study Group began meeting in July 2005 and the Study participants now include Pima County, the City of Tucson, the City of Phoenix, and Maricopa County. The Group is currently seeking other public agency participants that share the common obligation to their constituents to deliver capital projects as efficiently as possible.

Unlike the California Study, the Arizona effort will include gathering data on projects delivered using alternative delivery methods. CM at Risk, Design/Build and Job Order Contracting (JOC), are used extensively in Arizona and there is an interest among the Arizona participants to identify the costs and benefits of, and to improve, these project delivery methods as well as the traditional design-bid-build process. While this document does not include data or a discussion on these alternative methods, it remains an objective of the study team to build a database that would enable credible discussions in a future version of this report.

Projects (data) that are included in this study, and the analyses of them herein, were delivered using the traditional design-bid-build method. The projects were completed in the last five years. Only projects with a construction value of over $100,000 were used. The projects have been subdivided into categories of similar type and classifications. The objective of creating a statistically credible database, which would require a minimum of 8 to10 projects be contributed by each agency, in each classification, has been targeted.

B. Introduction

Pima County, the City of Phoenix, the City of Tucson, and Maricopa County have combined Capital Improvement Programs (CIP) totaling over $11 Billion. The projects included in these Capital Improvement Programs will include new and improved roads and bridges, utility infrastructure, municipal buildings, park improvements, and other facilities to serve the communities and to support continued growth and an enhanced quality of life.

While construction costs represent a significant expenditure, they do not represent the entire cost of the projects. There are additional, significant costs – over and above construction – the costs to ***deliver*** these projects. The costs associated with the project delivery process – planning, design, environmental remediation and documentation, value engineering, permits, construction management, closeout and startup -- are influenced by many factors such as project size and complexity, whether the project is new construction or rehabilitation, the agency's internal organization, project priority, clear scope definition, and more.

Considering the magnitude of construction ahead, the agencies felt that it was important to research and to “benchmark” the agencies’ cost history in delivering projects. It was also felt that it would be useful to look at the processes and procedures used to deliver projects and to see if the historical (benchmarked) project delivery costs could be improved. However, the scope of the process benchmarking effort to date has been limited. The focus during this nine month effort has been to determine exactly what agencies are spending on project delivery as a percentage of total construction cost.

The initial objective was to provide a general analysis of the efficiency of capital project delivery within the agencies based on project delivery data collected on projects delivered over the previous five years. The study includes comparative data on costs and schedules of Municipal Facilities, Streets Projects, Parks, and Pipes and Plants.

While the scope of this study primarily addresses performance benchmarking, a further examination of the processes and procedures used in delivering the projects, resulting in a list of Best Management Practices and an implementation plan for those practices, will be considered in the next phase.

C. Study Methodology

This study was conducted in three steps as follows:

1. A set of general requirements for study and project parameters were established. Consultant and Agency staff researched financial data on more than 216 projects. (All projects included in the study were completed within the last five years.) Data was sorted and summarized by project type and project phase (Design and Construction Management) in a special questionnaire designed for this particular benchmarking effort.

2. The Benchmarking Database was customized to generate project performance historical cost data on agency projects in a regression curve format related to design, construction management, and total project delivery as a percentage of Total Construction Cost.

3. Performance data on 216 projects with a total construction value of over $770 Million was used to develop the comparative project delivery performance benchmarking curves for Agency projects.

D. Conclusions of Performance Benchmarking

The following performance benchmarking conclusions were based on an analysis of project data:

- **The percentage of design costs generally decreased with the increasing size of the projects. For 216 projects with total construction cost of $ 770 Million, design costs average 18.1% of the total construction cost.**

- **The construction management costs as a percentage of total construction costs decreased as the total construction costs increased. For 216 projects with a total construction cost of $770 Million, construction management costs average 14.6% of total construction cost.**

- **Based on the performance data, total project delivery cost (total design cost and construction management cost), for 216 projects with a total construction cost of $770 Million averaged 32.7% of the total construction cost.**

Benchmarking data on change orders and project durations was gathered and analyzed. However, there were no apparent correlations between change order amounts or durations as related to total construction cost. It was felt that data is insufficient at this time to draw any conclusions in these areas.

The Performance Benchmarking Database provides a tool that can be used, cautiously to compare any one project to the average performance of all of the agencies over a period of time. This tool, augmented by additional data, could also be used to predict resource requirements to deliver projects and to estimate change orders and total duration of a construction project of given type and size.

During the performance benchmarking, the availability of data was a distinct challenge. The various Agencies used several cost coding processes and in some cases, due to the method of gathering data it required a substantial effort to obtain accurate information. Because of this difficulty, it was not possible to collect and segregate the cost data into more than two project phases. While it would be desirable to know and be able to compare the costs of smaller, more succinct categories such as “planning”, “pre-design”, “design”, “bid & award”, and “closeout,” because of the cost accounting records, this is currently not possible.

E. Best Management Practices

Part of this Study effort was the gathering of baseline information on which Best Management Practices (BMP’s) the agencies were using to deliver projects. A survey questionnaire was developed and sent out to all agency participants using 30 of the targeted Best Management Practices from the California Multi-Agency CIP Study.

While the results varied between agencies, it generally appeared that there was agreement that a number of BMP’s were important to the agencies’ mission or were those that the agencies found through experience, should be included in their contracts or Agency procedures.

Phase Two

As the Study moves into the second phase, these BMP's will be reviewed and discussed within the Team to determine which would be best for producing the most efficient project delivery for each agency. It is expected that the BMP list will grow as more practices are identified and individual agencies take ownership of certain practices. In the end it is anticipated that while some unique practices will be identified for certain agencies, and there will be a menu of "common" effective BMP's which should be accepted and implemented by all.

Chapter 2
INTRODUCTION

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A. Approach

The Team developed a step-by-step approach to the *Study* that would guide how to:

- Select and categorize projects to be included and their costs
- Define phases of projects and their durations
- Collect project data and accomplish the performance benchmarking objectives in the study

I. Categorizing Projects

The project team selected projects which fit the following criteria:

- The projects had a total construction cost of more than $100,000.
- The projects were completed within a recent and common time period (the five years prior to the initiation of the study.)
- The projects were delivered using the Design-Bid-Build delivery method.
- The projects represented project types that were common to the agencies' future capital project planning.
- The projects were delivered using representative project delivery processes.

Approximately 216 projects were identified as fitting the above criteria. These projects were divided into four types, Municipal Facilities, Streets, Parks, and Pipes and Plants projects. Data on all of the projects was then researched from the Agency records and occasionally, through interviews with project and construction management staff. See Table 2-1 for the Project Distribution Matrix developed for this Study.

Note: In this study, "regression curves" are graphs that show the trend of various costs of project delivery compared to overall construction costs. The purpose of developing these curves is to provide a tool that allows agencies to budget reasonably and appropriately for future project delivery costs.

II. Defining Project Phases

Ideally, the study team would have collected data from the five project phases (Pre-Design, Design, Bid & Award, Construction, and Post-Construction). However, based on data availability and reasonable conventions, it was decided to collect costs between project milestones. Therefore, the phasing is limited to Design and Construction. And, the analyses were limited to soft costs, as a percentage of total construction cost, expended;

- Design Phase - from the time a project budget was approved to the construction Notice to Proceed, and

- Construction Management Phase - from the construction Notice to Proceed to the Notice of Completion.

The study team was able to break down costs for design and construction phases. Therefore these became the two project phase categories defined for this study. The design phase is distinguished from the construction phase by the notice-to-proceed date.

Projects that experienced an extensive suspension of progress would require that the downtime be subtracted from the overall elapsed time to show a realistic project duration.

III. Classifying Costs

The performance benchmarking study used two cost categories:

1) **Design Costs**: The design phase (and associated costs) begins with the initial concept, includes planning as well as design, and ends with the issuance of a construction notice-to-proceed. Design costs consist of direct labor costs, other direct agency costs such as art fees and all necessary permits, and consultant services cost associated with planning and design. Design may include the following:

    - Schematic Design
        - Complete schematic design documents
        - Program scope review and development
        - Program evaluation of schedule and budget
        - Review of alternative approaches to design and construction
        - Obtain owner approval to proceed
        - Attend hearings and proceedings in connection with the project.
        - Prepare feasibility studies
        - Prepare comparative studies of sites, buildings, or locations
        - Provide submissions for governmental approvals
        - Provide services related to future facilities, systems, or equipment
        - Provide services as related to the investigation of existing conditions of site or buildings or to prepare as-built drawings
        - Develop life cycle costs
        - Complete environmental documentation and clearances
        - Manage right-of-way procurement process
    - Design
        - Complete design development documents including outline specifications
        - Evaluate budget and schedule against updated estimate
        - Complete design and specifications
        - Develop bid documents and forms including contracts
        - Complete permit applications
        - Coordinate agency reviews of documents

- Evaluate budget and schedule against updated estimate
- Review substitutions of materials and equipment
- Prepare additive or deductive alternate documentation
- Coordinate geotechnical, hazardous material, food services, acoustic or other specialty design requirements
- Provide interior design services

➢ Bid and Award Tasks
- Prepare advertisement for bids
- Perform prequalification of bidders
- Manage the pre-bid conference
- Perform the bid evaluations
- Prepare the recommendation for award
- Obtain approval of contract award from Board/Council
- Prepare the notice to proceed

2) **Construction Management Costs:** All the costs associated with the management of the construction of the project, including closeout costs, are included in this category. Construction management costs consist of direct labor, other agency costs, and consultant usage. Construction management may include the following:

➢ Construction Phase Tasks
- Pre-construction conference
- Review and approve schedule and schedule updates
- On-site management
- Review of shop drawings, samples, and submittals
- Testing and inspection
- Payment request processing
- Change order review, estimating, and negotiations
- Monthly reports to owner and agencies
- Project accounting and cost management
- Responding to requests for information
- Developing and implementing a project communications plan
- Document control
- Claim management
- Final inspections and punch list development and tracking
- Commissioning of facilities and equipment
- Training of maintenance and operation personnel
- Warranty and guarantee tracking and documentation
- Move-in planning
- Filing of notices (occupancy, completion, etc.)
- Checking and filing as-built documents

3) **Total Project Delivery Costs**: This is the total cost of delivering a capital improvement project. It is also the total of the design cost and construction management cost indicated above.

4) **Change Order Cost:** This consists of all change orders, including:

- Unforeseen and changed conditions
- Design changes
- Owner-initiated changes

5) **Construction Cost:** This is the direct construction cost, including all change orders during the construction phase (from the issuance of notice-to-proceed to substantial completion/beneficial occupancy). The following costs are associated with construction and are included in the total construction cost:

- Direct actual construction
- Total amount of change orders throughout construction
- Fixtures, furnishing, and equipment (FF&E)
- Utilities relocation
- Work performed by the agency's staff and other agencies' staff

It was agreed that land acquisition costs should be excluded from the total construction cost.

B. Performance Benchmarking

The study team developed a questionnaire that sought information about project costs. Data from the Agency's archives was plotted on regression curves that compared project delivery costs to overall construction costs. See Table 2-2 for an example of the Questionnaire developed for this Study.

Chapter 3
PERFORMANCE BENCHMARKING

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A. Guiding Principles

Performance benchmarking consisted of collecting documented project costs and comparing project **delivery** costs with **total construction** costs.

The study team developed a performance questionnaire (project data form) to collect performance data. The completed forms for each project are included in this study. Highlights of the questionnaire are as follows:

- Project costs include two delivery phases, Design Phase and Construction Phase. "Design Costs" include the soft costs of both planning and design as well as those soft costs expended during bid and award. "Construction Management Costs" include all construction management related costs from the time the NTP was issued to the time as-builts are completed and the Notice of Completion is filed.

- The total cost of each phase might include some costs other than labor, such as "other agency fees". These are reflected in the performance curves.

- "Land Acquisition" and any required offsite environmental remediation was excluded from the total construction cost.

- The project team agreed to use "Total Construction Cost" (including all Change Orders) as the basis of benchmarking (X-axis of the graphs). In-house construction related materials and services were also included in the total construction cost.

- Costs of project delivery tasks (planning, design, and construction management) consist of direct labor, other direct costs (such as other agency fees), and consultants costs, (as reflected in the performance questionnaire.

B. Data Collection

The agencies' staff collected and compiled the data which was given to the consultant for entry into the database. The consultant also developed the performance curves.

C. Performance Graphs Development

Project performance data are summarized and presented in the following pages. After collection and compilation of the performance data into a Microsoft Access database, the study team used a Visual Basic program to exchange performance data with Microsoft Excel in order to develop and review performance curves, using user-defined criteria.

- This database may be used by the Agencies to review and evaluate benchmarked models and lessons learned from the data trends.

The database is designed to facilitate additional data collection and instant development of the performance graphs. Twelve graphs are included in this study showing design, construction management, and total project delivery as a percentage of total construction cost for Municipal, Streets, Parks, and Pipes and Plant Projects. Tables 3-1a through 3.1d includes all Performance Curves developed for these categories.

D. Uses of Graphed Data

There are two purposes for these performance graphs. First, they can be used to compare past performance with the industry overall. Second, they can be used, cautiously, as a predictive tool to estimate various project delivery costs based on estimated construction cost, at bid time.

E. Coefficient of Determination

In order to learn how well the data points are modeled by a regression curve, "Goodness of Fit" can be evaluated using the R^2 parameter (Coefficient of Determination). R^2 is a value that evaluates proximity of data points to the regression curve. An R^2 equal to 1.0 represents a perfect fit and means that all data points fall exactly on the regression curve. An R^2 of 0.0 means that the regression model is totally inappropriate to represent data and may not be used to predict future trends.

What's a good R^2? Based on a history of this type of Study, an R^2 approaching 0.50 means that the curve can be used, with caution, for predictive purposes. However, a "good" R^2 is very subjective. It depends on the Study. For example, an R^2 of 0.99 may be good for predicting drug efficacy or a value of 0.05 might be good for predicting stock prices, however for the purpose of this Study historical precedent indicates that a "good" value for R^2 is 0.50.

The R^2's and the "N", number of projects represented by the curves is posted on each curve.

F. Best Management Practices

As noted previously, the objective of Phase One of this Benchmarking Study was to provide a general analysis of what agencies were spending to deliver projects as a percentage of the total construction cost. Of equal interest is an analysis of what processes are used and how effective those processes are in controlling the cost of project delivery.

Toward this end, a questionnaire was developed and sent out to all agency participants. The results from all sources within an agency were averaged and included as a composite (average) number for the agency. The BMP survey questionnaire is attached as Table 3-2 and the survey results are contained in Table 3-3.

While the results varied between agencies, it generally appears that there is agreement that the Best Management Practices below are important to the agencies' mission or have been found, through experience, to be effective in efficient project delivery because they are routinely included in the Agency procedures.

- Item No. 2, "Projects are well defined with respect to scope and budget, including obtaining tenant (or client) approval, prior to the start of design."
- Item No. 3, "The Agency has a prioritization system."
- Item No. 16, "Change orders are classified by type."
- Item No. 17, "A formal Dispute Resolution Process is included in all contracts."
- Item No. 18, "A Team building process is used on all projects with a value greater that $5 million."
- Item No. 19, "The Construction Management team is involved in the project before the completion of design."
- Item No. 21, "Bid advertisements are available on line."
- Item No. 22, "Bid documents are available on line."
- Item No. 28, Standard contracts for consulting services, with critical clauses (i.e., indemnification) are included in RFQ/RFP's."
- Item No. 29, "A consultant rating system has been implemented that identifies the quality of each consultant's performance on previous projects."

Phase Two

As the Study moves into the second phase, these BMP's will be reviewed and discussed within the Team to determine which would be best for producing the most efficient project delivery for each agency. It is expected that the BMP list will grow as more practices are identified and individual agencies take ownership of certain practices. In the end it is expected that while some unique practices will be identified for certain agencies, there will be a menu of "common" BMP's accepted and implemented by all.

G. Projects Data

Data collected from the participating agencies was used in developing the performance curves contained this Report. Additional data collection at future phases may improve the study conclusions. The data pool was representative of the Agencies' challenges in delivering a wide range of values of projects using similar processes.

H. Summary of Performance Models

Table 3-4, "Summary of Performance Models" is a preliminary look at the percentages of design, construction management, and total project delivery cost as a percentage of total construction cost. The information contained in this table should be used cautiously because of the limited number of projects included in the database at this time.

Table 2-1

Projects Distribution Matrix and Project Delivery Percentages Summary

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Projects Distribution Matrix

Traditional Delivery Method

Agency	Pima County	City of Tucson	City of Phoenix	Maricopa County	TOTAL
Municipal Facilities	**22**	**14**	**4**	**0**	**40**
CommunityBldg/Rec/Gym	11	10	1	0	22
Library	3	2	0	0	5
Police / Fire Station	3	2	3	0	8
Office - (TI's)	5	0	0	0	5
Streets	**25**	**16**	**12**	**28**	**81**
Signals & ITS	9	0	0	5	14
New Construction	2	0	0	3	5
Bridges - (Retrofits & New)	1	0	3	5	9
Reconstruction	4	16	8	1	29
Widening	9	0	1	14	24
Parks	**16**	**6**	**18**	**8**	**48**
Park Development/Additions	9	5	10	6	30
Restrooms	0	1	8	2	11
Sportsfield Lighting	7	0	0	0	7
Pipes & Plants	**11**	**0**	**41**	**3**	**55**
Treatment Plants	3	0	14	0	17
Gravity Pipes	8	0	11	3	22
Pressure Pipes	0	0	16	0	16
Total	**74**	**36**	**75**	**39**	**224**

Notes: Projects included in this analysis were completed between July 1, 2000 and July 1, 2005.

Arizona Benchmarking Study - Traditional Delivery Method

Project Delivery Percentage Summary

Agency	Design	Construction Management	Project Delivery
Agency B	14.7%	16.7%	31.4%
Agency D	16.4%	13.7%	30.1%
Agency E	26.8%	13.8%	40.6%
Agency G	16.6%	12.4%	29.0%
ALL AGENCIES	17.7%	14.5%	32.4%

Table 2-2
Sample Questionaire

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Sample Questionnaire

PROJECT DATA FORM

Agency: **Project Name**

Project Type

Project Index New / Rehab.: Complexity:

Justification:

Description

Comments

	PLANNING		DESIGN		CM COST		TOTAL	
	DOLLAR	% OF TCC	DOLLAR	% OF TCC	DOLLAR	% OF TCC	DOLLAR	% OF TCC
Agency Labor	$0.00	0.0	$0.00	0.0	$0.00	0.0	$0.00	0.0
Other Costs	$0.00	0.0	$0.00	0.0	$0.00	0.0	$0.00	0.0
Subtotal Agency	**$0.00**	0.0		0.0		0.0	**$0.00**	0.0
Consultant	$0.00	0.0	$0.00	0.0	$0.00	0.0	$0.00	0.0
Total	**$0.00**	0.0	**$0.00**	0.0	**$0.00**	0.0	**$0.00**	0.0
Duration		Months		Months		Months	0	Months

AMOUNT OF CONSTRUCTION CONTRACT	**$1.00**
COST OF CHANGE ORDERS	
UTILITY RELOCATION COSTS	
IN HOUSE CONST. RELATED MATERIALS AND SERVICES	
LAND ACQUISITION	
TOTAL CONSTRUCTION COST (TCC)	**$1.00**

CONTRACT COMPLETION DATE (MONTH YEAR)

Record No.

Table 3-1
Performance Curves

a. Municipal Facilities
b. Streets
c. Parks
d. Pipes and Plants

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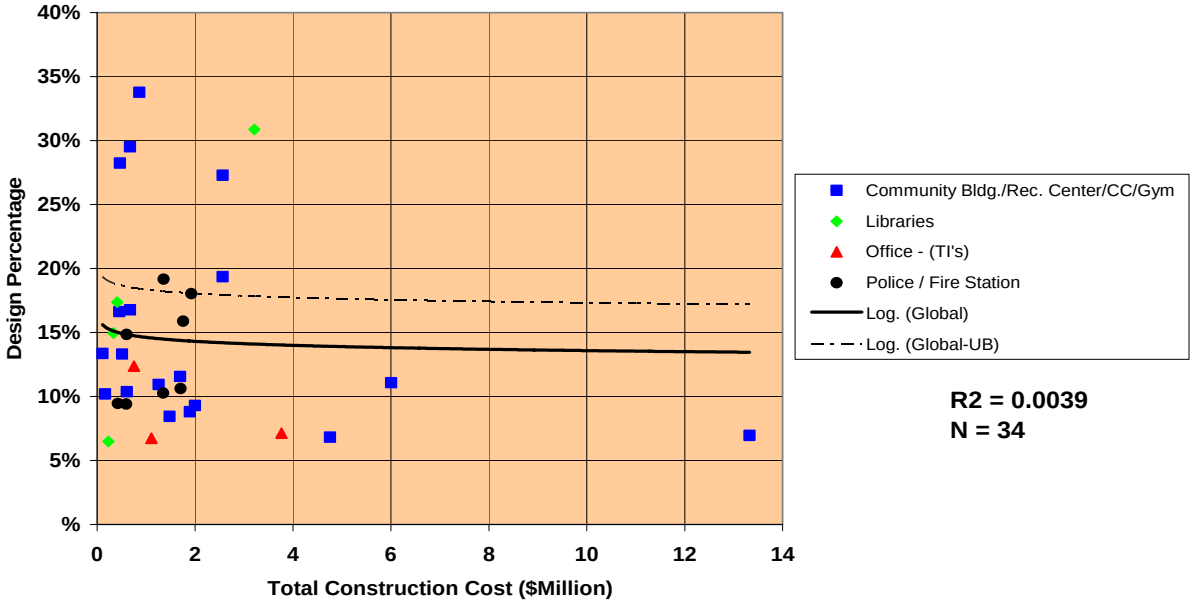
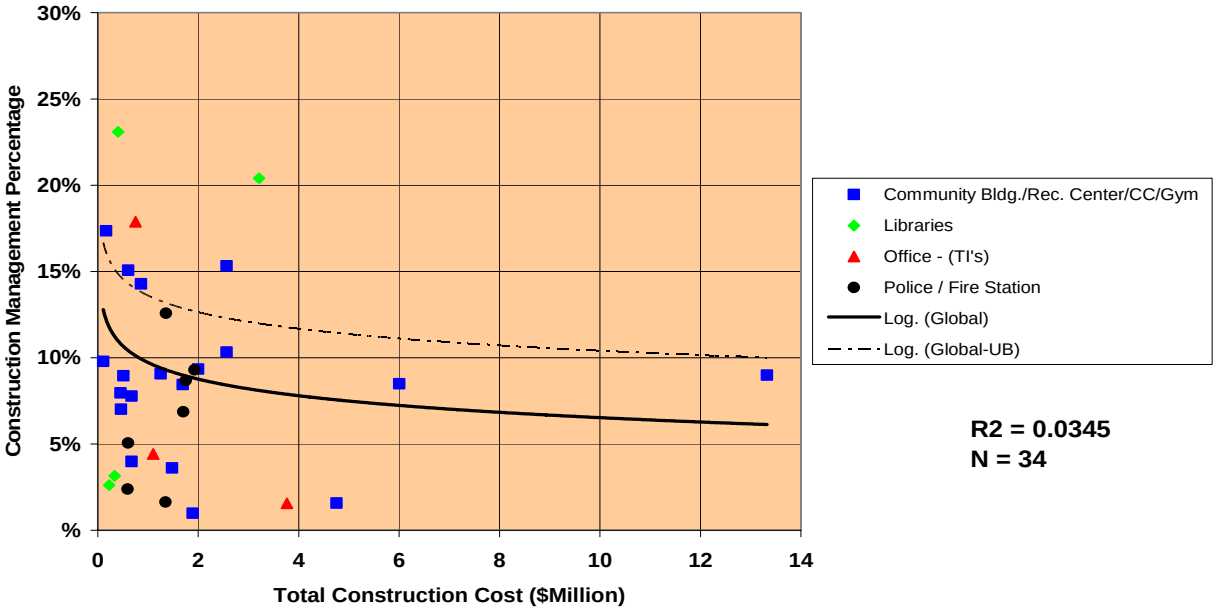
Municipal Facilities - All Classification

Design Percentage Versus Total Construction Cost



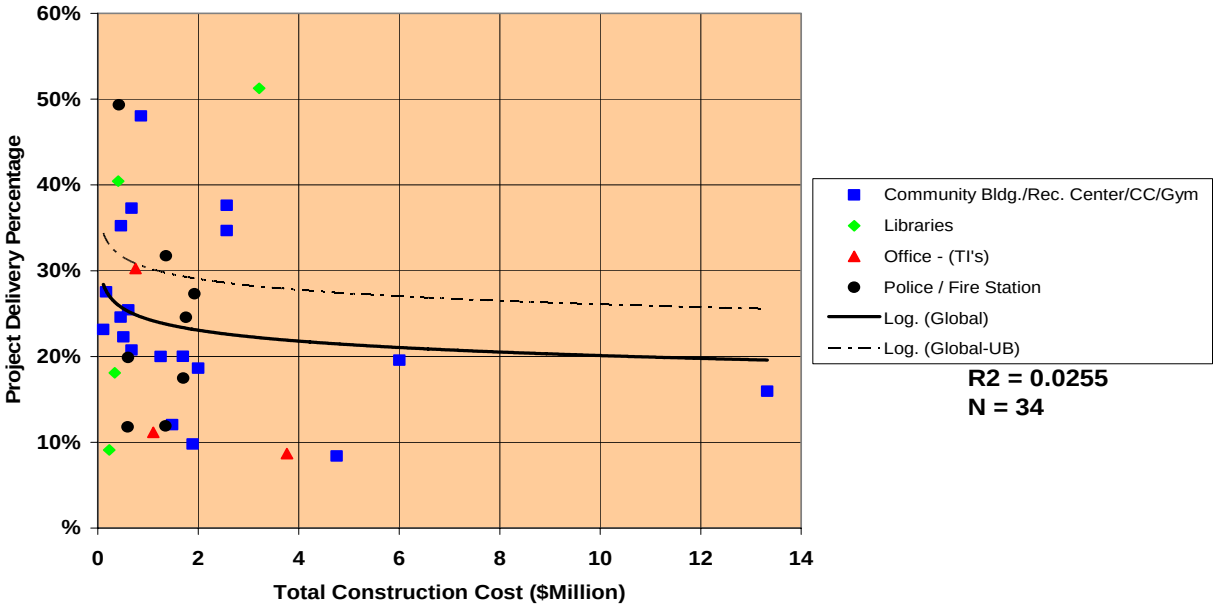
Municipal Facilities - All Classification

Construction Management Percentage Versus Total Construction Cost



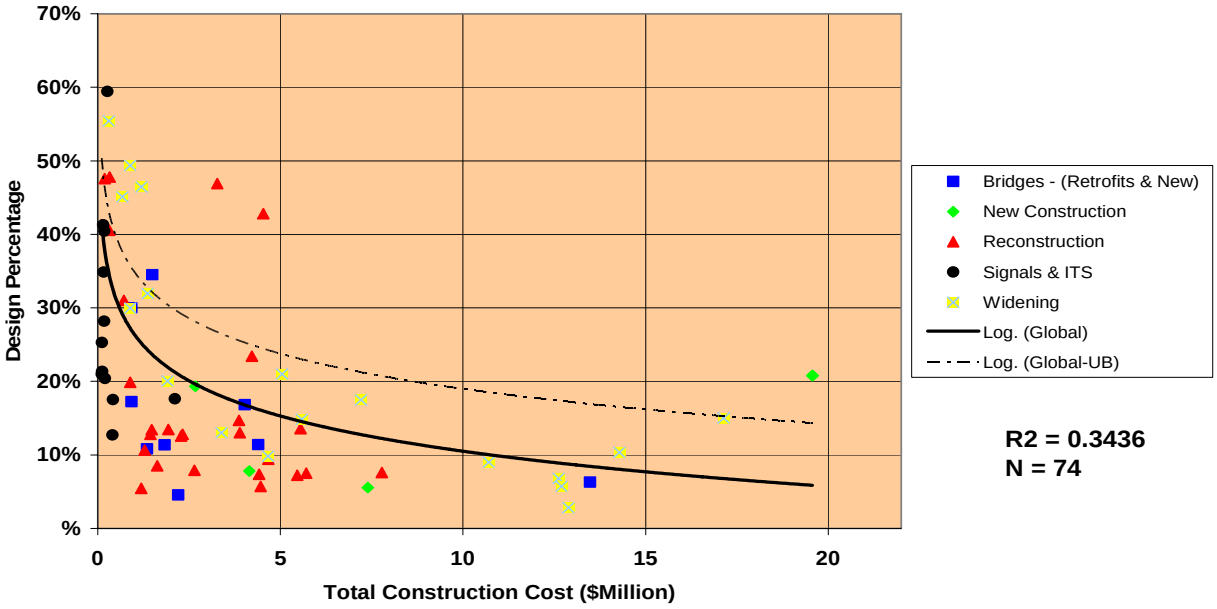
Municipal Facilities - All Classification

Project Delivery Percentage Versus Total Construction Cost



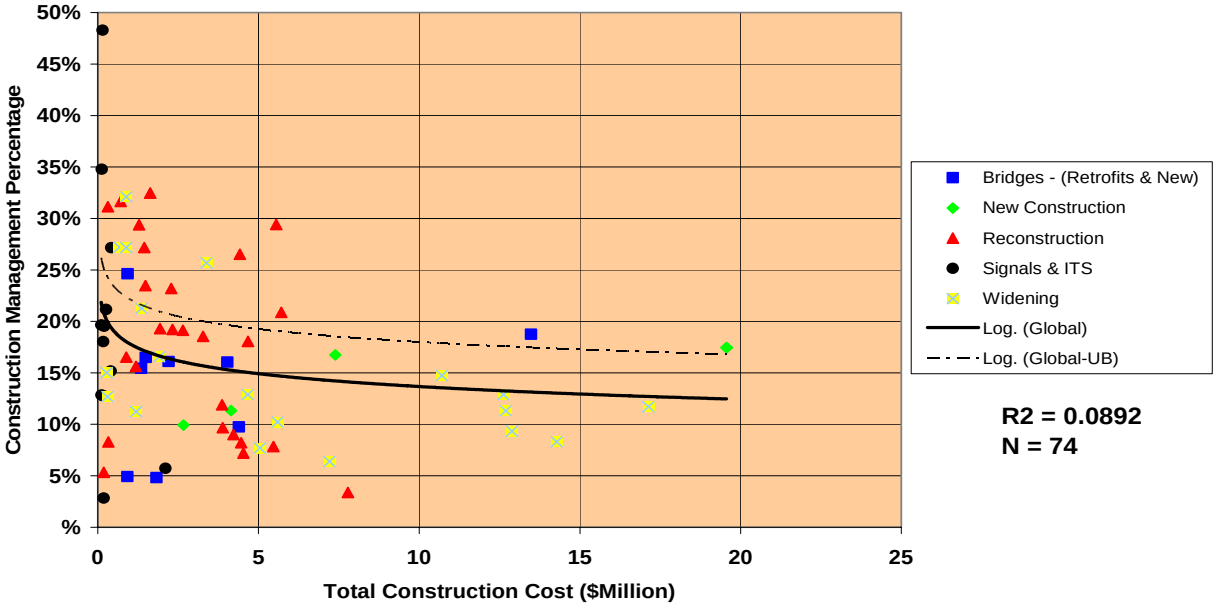
Streets - All Classification

Design Percentage Versus Total Construction Cost



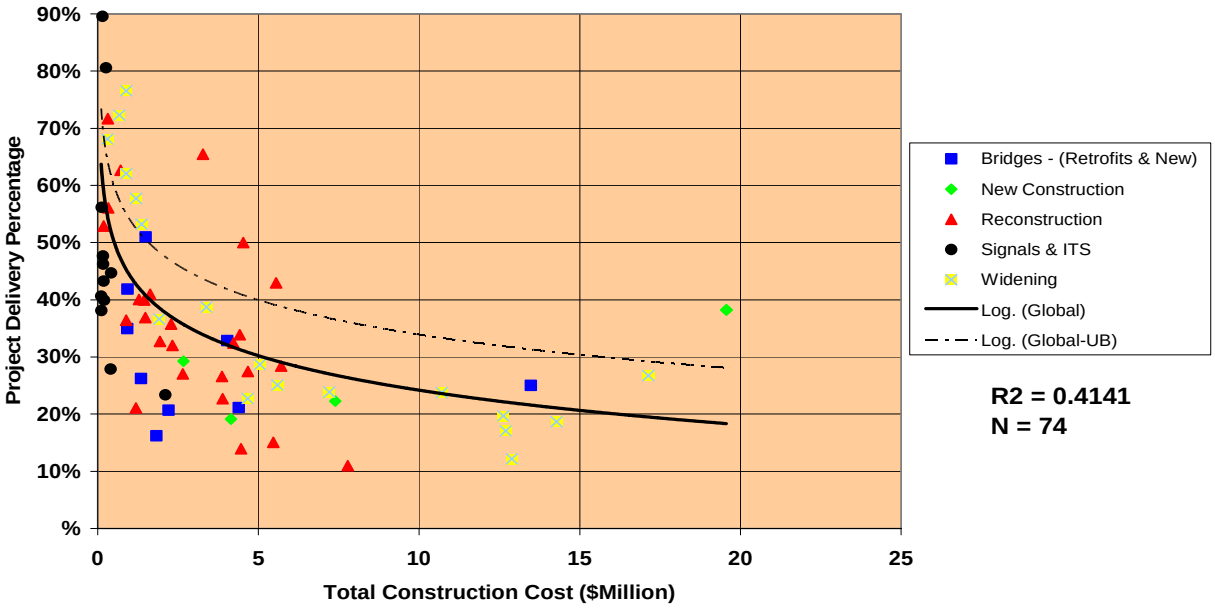
Streets - All Classification

Construction Management Percentage Versus Total Construction Cost



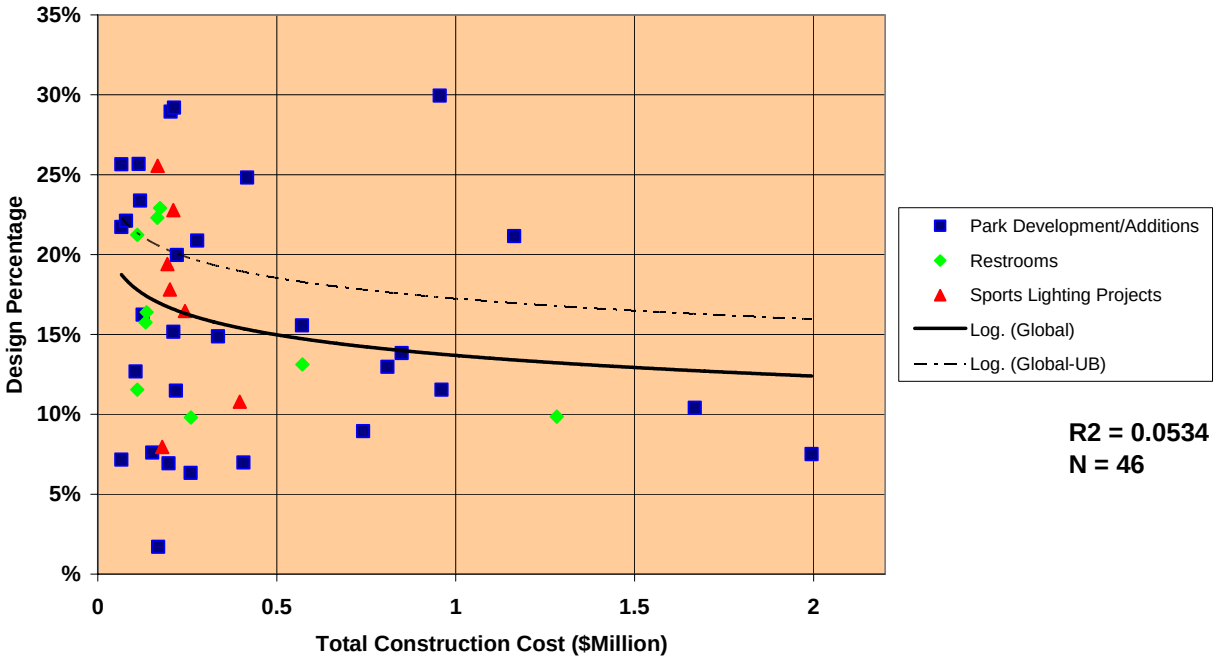
Streets - All Classification

Project Delivery Percentage Versus Total Construction Cost



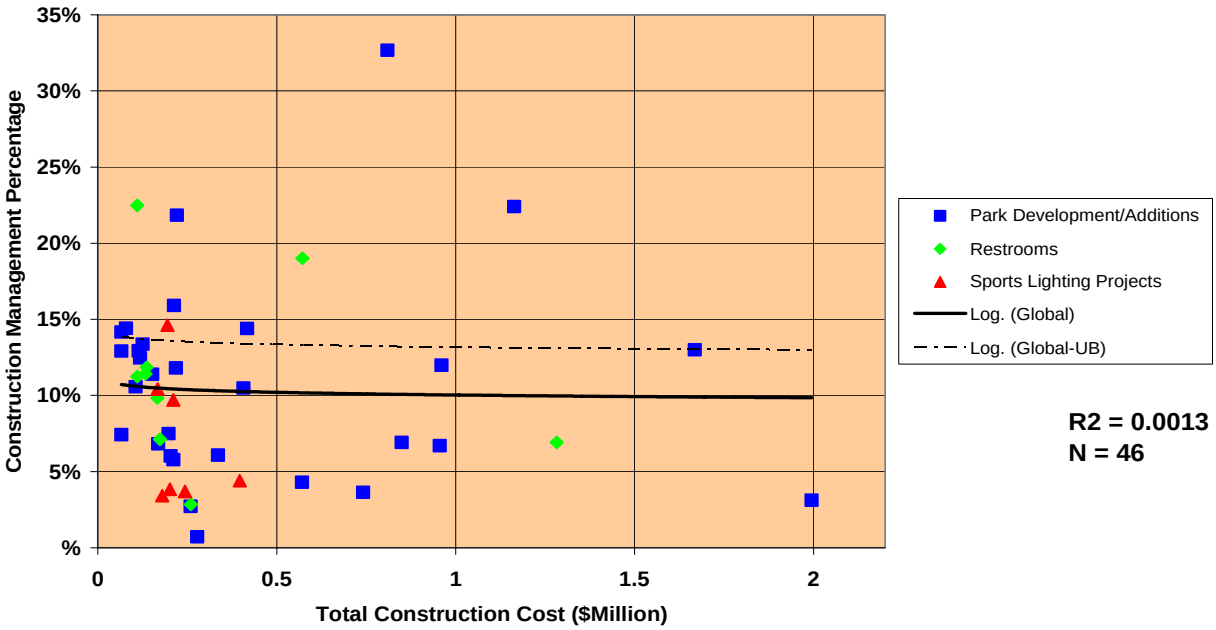
Parks - All Classification

Design Percentage Versus Total Construction Cost



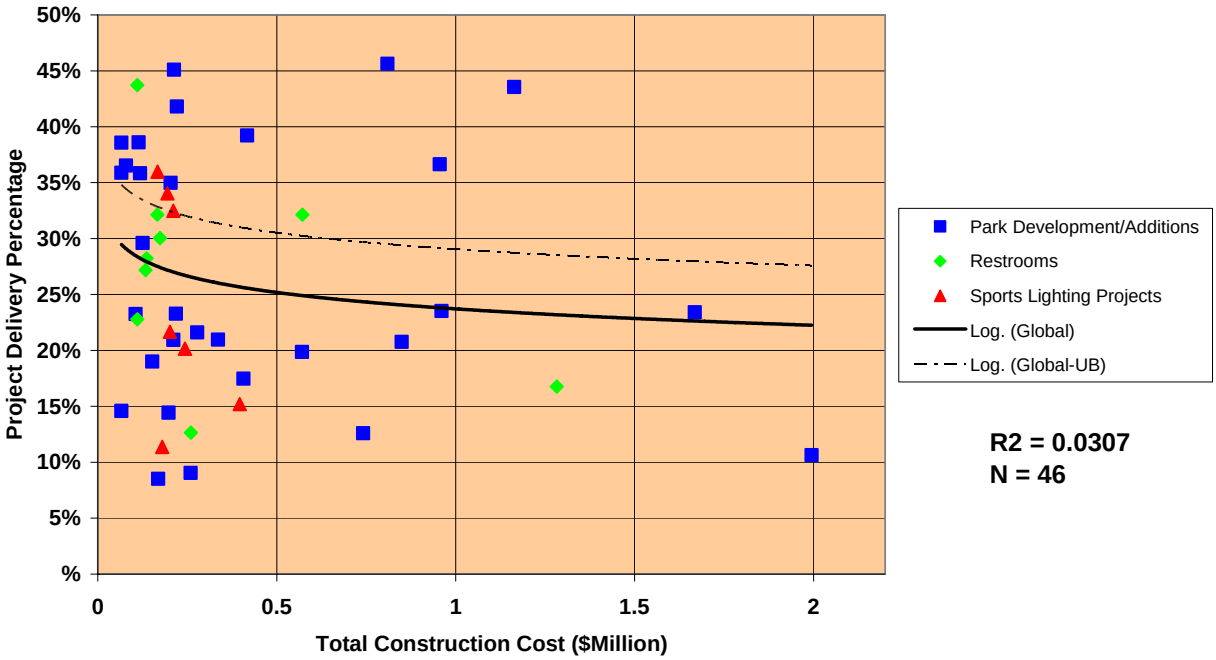
Parks - All Classification

Construction Management Percentage Versus Total Construction Cost



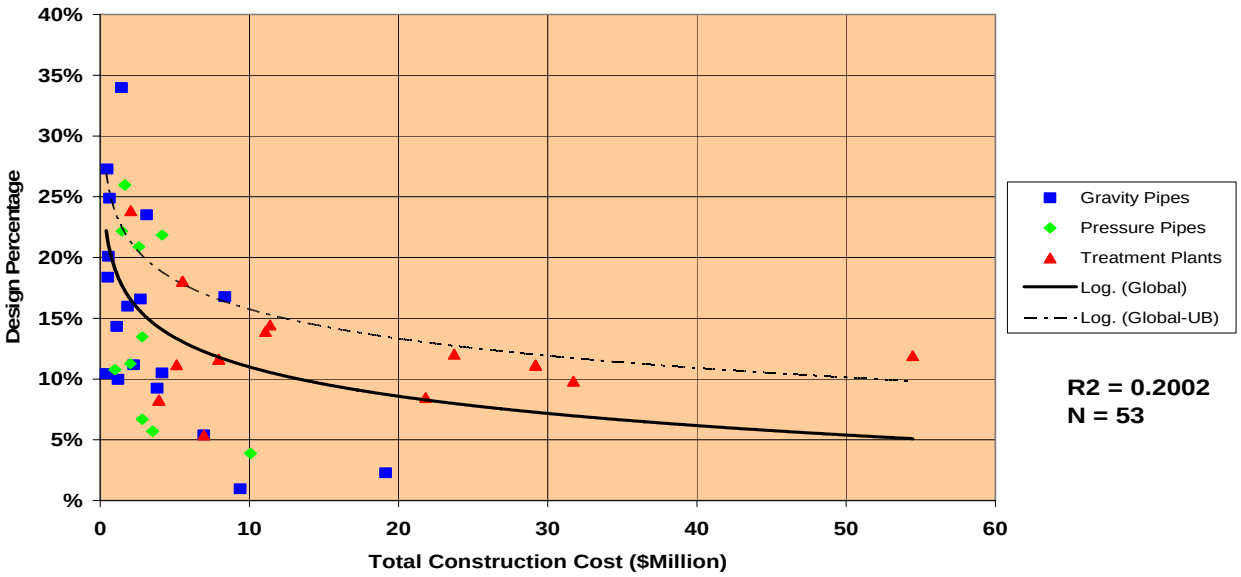
Parks - All Classification

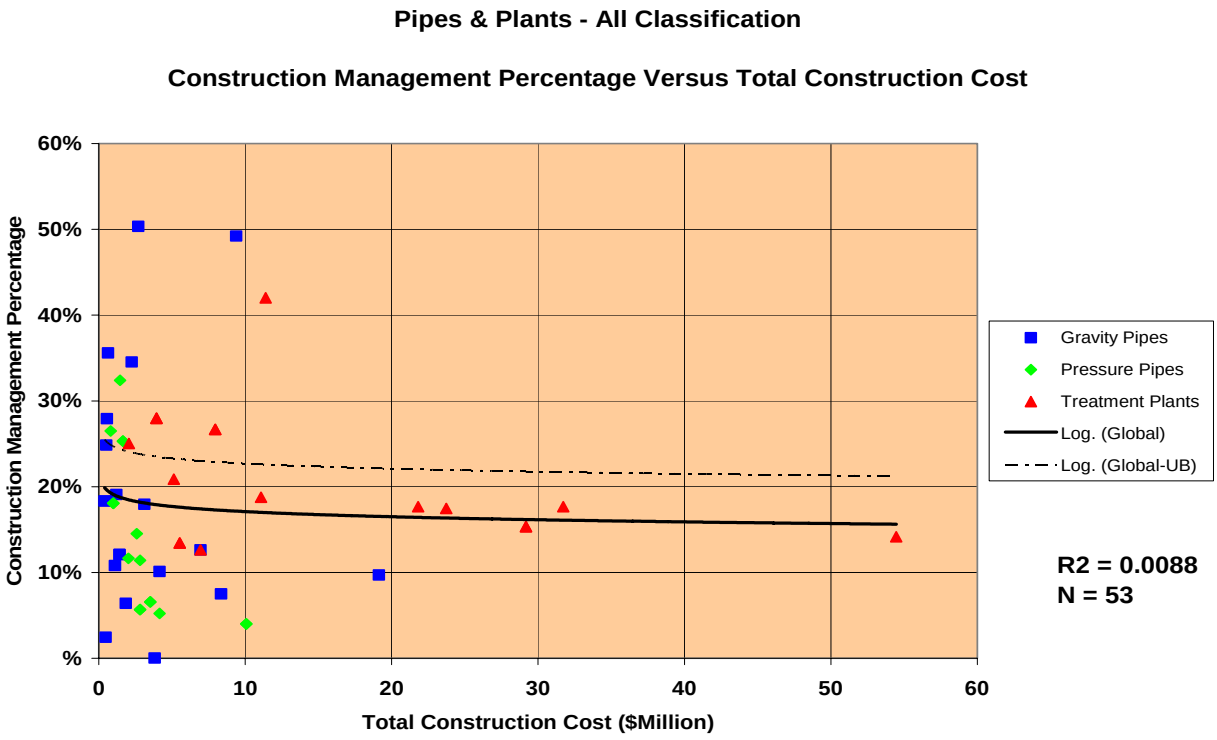
Project Delivery Percentage Versus Total Construction Cost



Pipes & Plants - All Classification

Design Percentage Versus Total Construction Cost




Pipes & Plants - All Classification
Construction Management Percentage Versus Total Construction Cost
Construction Management Percentage
60%
50%
40%
30%
20%
10%
%
0
10
20
30
40
50
60
Total Construction Cost ($Million)
Gravity Pipes
Pressure Pipes
Treatment Plants
Log. (Global)
Log. (Global-UB)
R2 = 0.0088
N = 53

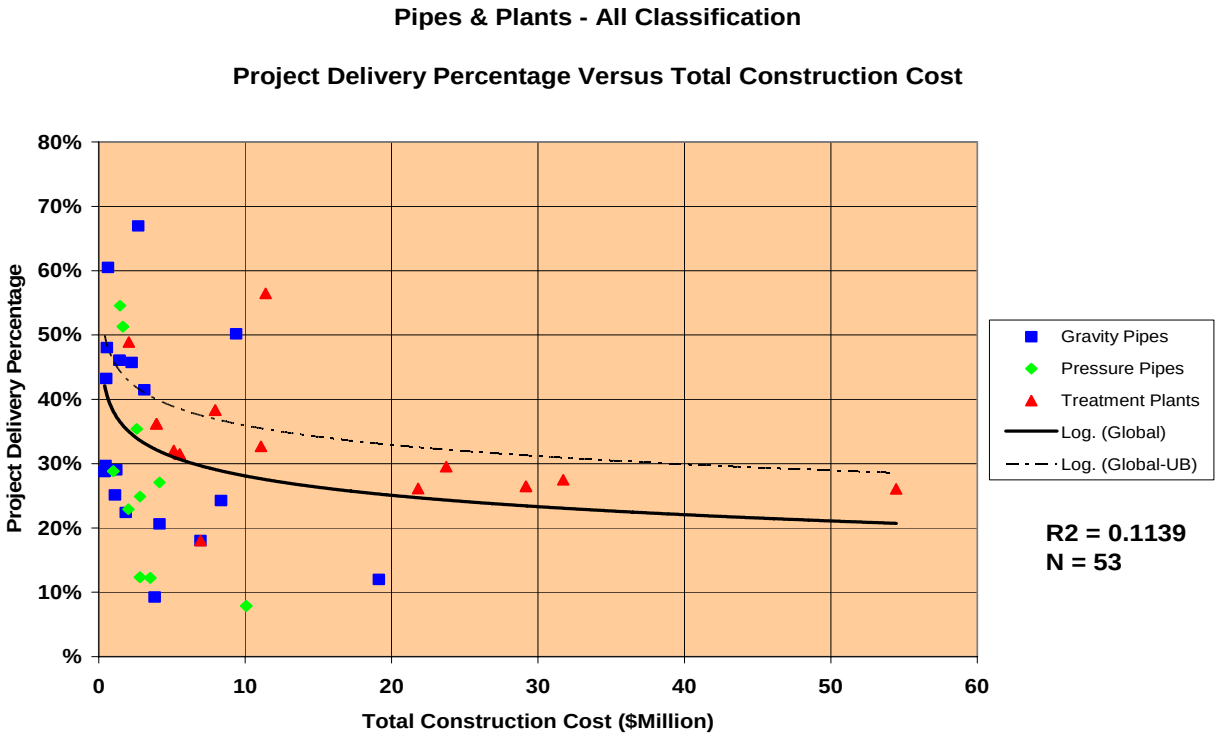

Pipes & Plants - All Classification
Project Delivery Percentage Versus Total Construction Cost
Project Delivery Percentage
80%
70%
60%
50%
40%
30%
20%
10%
%
0
10
20
30
40
50
60
Total Construction Cost ($Million)
Gravity Pipes
Pressure Pipes
Treatment Plants
Log. (Global)
Log. (Global-UB)
R2 = 0.1139
N = 53

Table 3-2
BMP Survey

VANR
Construction Management, Inc.

Best Management Practices Survey

Name: _____

Agency: _____

Date: _____

Survey of Project Delivery Procedures

Please rate the following questions on a scale of 1 to 5. A rating of "1" indicates that the process/procedure is not done and a rating of "5" indicates that the process/procedure is implemented on every project.	**Scale**				
1. Complete feasibility studies are done on projects prior to defining scope and budget	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
2. Projects are well defined with respect to scope and budget, including obtaining tenant (or client) approval, prior to the start of design.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
3. The Agency has a prioritization system.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
4. Program planning includes design and construction resource loading.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
5. Program planning includes a Master Schedule that includes start and finish dates for each project.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
6. All projects shown on a Geographical Information System.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
7. Designers are provided with a clear, precise, scope, schedule, and budget prior to design start.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
8. Requirements for reliability, maintenance, and operation are defined prior to design initiation	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
9. Successful designs are re-used and site adapted whenever possible	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
10. Scope changes are limited to the early stages in design.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
11. Approved scope changes are accompanied by budget and schedule modifications.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
12. A standardized Project Delivery Manual is used on all projects	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
13. Value Engineering Studies are performed on all projects with a value greater than $1 million.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
14. A formal Quality Management System is used to assure the quality of the design documents and of construction.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

15. Post project reviews are performed and used to identify “lessons learned.”	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
16. Change orders are classified by type.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
17. A formal Dispute Resolution Process is included in all contracts.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
18. A team building process is used on all projects with a value greater than $5 million.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
19. The Construction Management team is involved in the project before the completion of design.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
20. A pre-qualification process is used on large, complex projects.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
21. Bid advertisements are available on line.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
22. Bid documents are available on line.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
23. Bids can be submitted/accepted on line.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
24. Formal training for project managers is provided on a regular basis.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
25. A standard Project Controls System is used on all projects.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
26. There is a special project management team for small projects.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
27. There are procedures in place to measure and ensure Project Manager performance and accountability.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
28. Standard contracts for consulting services, with critical clauses (i.e. indemnification) are included in RFQ/RFP’s.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
29. A consultant rating system has been implemented that identifies the quality of each consultant’s performance on previous projects.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Thank you for completing the survey.

Table 3-3
BMP Survey Results

VANR
Construction Management, Inc.

Best Management Practices - Survey Results

Item	BMP	Agency D	Agency G	Agency E	Comments
1	Complete feasibility studies are done on projects prior to defining scope and budget	2.33	3.00	4.00	
2	Projects are well defined with respect to scope and budget, including obtaining tenant (or client) approval, prior to the start of design	3.00	4.50	3.00	
3	The Agency has a prioritization system	2.56	4.00	5.00	
4	Program planning includes design and construction resource loading.	2.11	3.50	1.00	
5	Program planning includes a Master Schedule that includes start and finish dates for each project.	3.67	4.00	1.00	Agency E - Five year plan prepared and updated showing each project phase but without exact dates.
6	All projects shown on a Geographical Information System.	3.56	4.50	1.00	
7	Designers are provided with a clear, precise, scope, schedule, and budget prior to design start.	3.78	3.50	3.00	
8	Requirements for reliability, maintenance, and operation are defined prior to design initiation	2.22	3.00	3.00	
9	Successful designs are re-used and site adapted whenever possible	2.67	4.00	1.00	Agency E - Standard details used but not complete designs or portions of designs.
10	Scope changes are limited to the early stages in design.	2.67	3.00	2.00	
11	Approved scope changes are accompanied by budget and schedule modifications.	3.56	3.00	1.00	
12	A standardized Project Delivery Manual is used on all projects	2.44	2.00	1.00	Agency E - Manual is out of date and must be revised to accommodate new processes and organization.
13	Value Engineering Studies are performed on all projects with a value greater than $1 million.	2.44	2.50	3.00	
14	A formal Quality Management System is used to assure the quality of the design documents and of construction.	2.11	3.00	2.00	
15	Post project reviews are performed and used to identify “lessons learned.”	2.44	3.00	2.00	
16	Change orders are classified by type.	3.00	2.50	5.00	
17	A formal Dispute Resolution Process is included in all contracts.	4.22	4.50	5.00	
18	A team building process is used on all projects with a value greater than $5 million.	3.00	4.00	5.00	
19	The Construction Management team is involved in the project before the completion of design.	2.89	4.00	5.00	
20	A pre-qualification process is used on large, complex projects.	2.78	4.00	1.00	Agency D - Would rate a 5 for design and 1 for construction.
21	Bid advertisements are available on line.	4.56	4.50	5.00	
22	Bid documents are available on line.	2.33	4.00	5.00	
23	Bids can be submitted/accepted on line.	1.00	1.00	1.00	
24	Formal training for project managers is provided on a regular basis.	2.56	2.00	1.00	Agency E - Training is as needed but not on a regular basis.
25	A standard Project Controls System is used on all projects.	2.33	1.50	2.00	
26	There is a special project management team for small projects.	2.00	1.50	1.00	
27	There are procedures in place to measure and ensure Project Manager performance and accountability.	2.89	2.00	3.00	
28	Standard contracts for consulting services, with critical clauses (i.e. indemnification) are included in RFQ/RFP’s.	4.78	4.50	5.00	
29	A consultant rating system has been implemented that identifies the quality of each consultant’s performance on previous projects.	4.89	3.50	3.00	

Table 3-4
Summary of Performance Models

VANR
Construction Management, Inc.

Summary of Performance Models

Project Type Classification	TCC	Design Cost (% of TCC)	CM Cost (% of TCC)	Project Delivery Cost (% of TCC)
Municipal Facilities				
Community Bldg/Rec/Gym	TCC<$0.50 M	13 to 28%	7 to 17%	23 to 35%
	$0.5M<TCC<$3M	8 to 34%	1 to 15%	10 to 48%
	TCC>$3M	7 to 11%	2 to 9%	8 to 20%
Libraries	TCC<$0.50 M	6% - 17%	3 to 23%	9 to 40%
	$0.5M<TCC<$3M	N/A	N/A	N/A
	TCC>$3M	31%	20%	20%
Police/Fire Station	TCC<$0.50 M	9%	40%	49%
	$0.5M<TCC<$3M	9 to 18%	2 to 13%	12 to 32%
	TCC>$3M	N/A	N/A	N/A
Office - (TIs)	TCC<$0.50 M	N/A	N/A	N/A
	$0.5M<TCC<$3M	7 to 12%	4 to 18%	11 to 30%
	TCC>$3M	7%	2%	9%
Streets				
Signals & ITS	TCC<$0.50 M	13 to 59%	3 to 48%	28 to 90%
	$0.5M<TCC<$3M	18%	6%	23%
	TCC>$3M	N/A	N/A	N/A
New Construction	TCC<$0.50 M	N/A	N/A	N/A
	$0.5M<TCC<$3M	19%	10%	29%
	TCC>$3M	6 to 21%	11 to 17%	19 to 38%
Bridges - (Retrofits and New)	TCC<$0.50 M	N/A	N/A	N/A
	$0.5M<TCC<$3M	5 to 34%	5 to 25%	16 to 51%
	TCC>$3M	6 to 17%	10 to 19%	21 to 33%
Reconstruction	TCC<$0.50 M	41 to 48%	5 to 31%	53 to 72%
	$0.5M<TCC<$3M	5 to 31%	16 to 32%	21 to 63
	TCC>$3M	6 to 29%	3 to 29%	11 to 65%
Widening	TCC<$0.50 M	55 to 77%	13 to 15%	68 to 92%
	$0.5M<TCC<$3M	20 to 49%	11 to 32%	37 to 77%
	TCC>$3M	3 to 21%	6 to 26%	12 to 39%
Parks				
Park Developments and Additions	TCC<$0.50 M	2 to 29%	1 to 23%	9 to 45%
	$0.5M<TCC<$3M	8 to 30%	3 to 33%	11 to 46%
	TCC>$3M	N/A	N/A	N/A
Restrooms	TCC<$0.50 M	10 to 23%	3 to 23%	13 to 44%
	$0.5M<TCC<$3M	10 to 13%	7 to 19%	17 to 32%
	TCC>$3M	N/A	N/A	N/A
Sportsfield Lighting	TCC<$0.50 M	8 to 26%	3 to 15%	11 to 36%
	$0.5M<TCC<$3M	N/A	N/A	N/A
	TCC>$3M	N/A	N/A	N/A
Pipes and Plants				
Treatment Plants	TCC<$0.50 M	N/A	N/A	N/A
	$0.5M<TCC<$3M	24%	25%	49%
	TCC>$3M	5 to 18%	13 to 42%	18 to 56%
Gravity Pipes	TCC<$0.50 M	10 to 27%	2 to 18%	29 to 30%
	$0.5M<TCC<$3M	11 to 34%	6 to 50%	22 to 67%
	TCC>$3M	1 to 24%	10 to 49%	9 to 50
Pressure Pipes	TCC<$0.50 M	N/A	N/A	N/A
	$0.5M<TCC<$3M	7 to 55%	6 to 32%	12 to 81%
	TCC>$3M	4 to 22%	4 to 7%	8 to 27%

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