Cost Estimating Guideline

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Section 1 – Introduction

1.0 Purpose

The purpose of this guideline is to provide guidance to NJDOT employees and others in the methodology and for developing, documenting, reviewing and updating construction cost estimates throughout the project development process.

In order to successfully address transportation needs, the NJDOT must have reliable construction cost estimates and associated construction cost estimate documentation that supports the development of the construction cost estimate from project programming and planning through project Plans, Specifications and Estimate (PS&E).

This guidance is to be used by all NJDOT service areas, e.g. Capital Investment Planning and Grant Administration, Capital Program Management, Operations, Transportation System Management.

1.1 General Estimating Concepts

Cost estimating is a skill and art form. To successfully estimate project construction cost, the estimators should follow these general estimating concepts:

- At the NJDOT, a Capital project construction cost estimate is comprised of the raw construction estimate, and cost estimates covering construction inspection personnel, construction engineering services to be provided by the project's Designer-of-record (CE costs), utility accommodations required for the project, and construction contingencies estimate. Not included in the construction cost estimates, but equally important is the Right of Way estimate.
- A Capital project construction cost estimate is first developed in early project planning and updated periodically throughout project development from project programming through project award. The Project Manager, with the assistance of the project's designer, are to update a project's Capital project construction cost estimate either annually or when a significant change in the project has occurred that effects the estimate, whichever is soonest. Ideally, estimates are to be updated prior to the PM's annual fall meeting with Capital Program Coordination to request project funding.
- There are several methods and tools used to develop a construction cost estimates, e.g. Historical Bid-based estimating, Historical Percentages estimating, Conceptual estimating, Cost-based (Scratch) estimating, Risk-based estimating, Similar Project estimating, and AASHTOWare Project Cost Estimation software (CES).
- The estimate should be prepared by a multi-disciplined team that has experienced key personnel dedicated to the success of the major project, with the requisite technical, managerial, leadership, and communication skills. The team should also have a thorough understanding of the project, including the ability to determine and evaluate critical issues and risks.

Since estimates are tracked throughout the life of the project, all estimates and assumptions must be well documented, including what is and what is not in the estimate. The documentation should be in a form that can be understood, checked and verified.

1.2 Contents of the Cost Estimating Guideline

The *Estimating Guideline* contains six sections. The following provides a brief summary of each section:

Section 1, *Introduction,* this section provides the purpose of the Cost Estimating guideline, general cost estimating concepts, and introduces each of the sections.

Section 2, *Cost Management Process,* discusses estimating concepts throughout the project development stages and the detailed estimating process throughout the project development phases.

The chapter also discusses the importance of documenting the assumptions made throughout the project development process with respect to key items of work.

Section 3, *Cost Estimating Methods,* discusses historical, conceptual, risk-based, and cost-based estimating methods and estimating software.

Section 4, *Cost Estimating Factors,* discusses cost drivers and the impact that each has on the construction cost estimate throughout the project development process.

Section 5, *Estimate Review,* discusses the review process that is to be used by the Project Manager and the project team

Section 6, *Bid Analysis,* discusses the parameters to analyze bids from total project bid amount to individual items.

Section 2 – Cost Management Process

2.0 Estimating Concepts Throughout Project Development Stages

Note:

The following concepts are meant to provide an estimating overview. Estimating specifics are outlined in the "NJDOT Cost Estimation Process by CPD Delivery Phase" section.

To successfully address transportation needs, estimators and Designers must follow the construction cost estimate development guidance and provide the associated cost estimates throughout each project development stage. The construction cost estimate for each level of project development has a specific purpose, methodology, and is expected to have a certain level of accuracy. As the project progresses, more of the project's parameters will be defined and the expected accuracy of the estimate will increase. As such, the work effort required to prepare, document and review the estimate also increases.

At a minimum, the construction cost estimate should be developed, reviewed, recorded and updated at each of the following project development stages:

- Programming and Planning (TIP development, Problem Screening Phase)
- Scoping (Concept Development Phase)
- Design Development (Preliminary Engineering and Final Design Phases)
- PS&E (Engineer's Estimate in Final Design Phases)

Also, NJDOT Corrective Action Notice (CAN) 070 indicates a submission of an annual update of construction cost estimates. Project Management handles this responsibility.

Project Development Stages

Programming and Planning: The programming and planning level estimate is used to estimate the probable funds needed for long range planning and prioritization for the TIP. At this stage, estimates are prepared with minimal project definition and are usually conceptual in nature. The estimate can be prepared using estimating cost data that is based solely upon historic lane-mile cost averages for similar projects for roadway work; or upon square-foot cost averages for bridge work. Additional costs for utility work, mitigation work, maintenance of traffic, etc., should also be included. At this point, it may be appropriate to express the costs as a range.

Scoping: A scoping level estimate is used to set the baseline cost for the project against which all future estimates will be compared. It is important to clearly document the scope definition and assumptions during this stage so that all future construction cost estimate changes can be accurately compared to this estimate. At the time of project scoping, the project should begin to have sufficient project definition in order for the Designer to develop approximate quantities based on overall project length and or structure sizes for items such as asphalt, concrete pavement, structures, or roadway excavation. For such quantifiable items, historical bids are often used to develop a base unit price that is then adjusted for potential cost driver impacts. At this stage, cost estimates are also developed and used to compare the estimated costs of alternatives under consideration for addressing the identified transportation needs.

Design Development: Throughout the project design process, the known project work items and associated quantities and unit prices will be used to develop a more refined construction cost estimate. These milestone estimates will be used to compare against the current programmed amount. This will solidify many items in the scope such as right-of-way, likely permit conditions, environmental mitigation, and quantities of major items of work. The estimate may need to be updated along with NEPA Clearance with respect to environmental clearance, commitments, and mitigation as well as any changes to the scope of the project

As items and quantities become finalized, most of the contingencies will also be accounted for within the estimate. Unit prices should begin to be compared or updated for current market conditions. The estimator should also account for escalating costs on price-volatile items.

PS&E: The Engineer's Estimate is developed for the Bid Package Review in preparation for advertisement. In addition, the Engineer's Estimate is used to obligate construction funds and to evaluate contractor's bids. By the end of this stage all contingencies should be quantified and accounted for within the estimate items.

2.1 NJDOT Cost Estimation Process by CPD Delivery Phase

Inflation

All NJDOT projects are to include inflation when providing future year construction cost estimates. The inflation factor to be used is 3% (simple, not compound) and the inflation adjustment is based on the number of years between year of estimate and year of project letting date.

Example: The 2016 construction cost estimate for a proposed NJDOT project is $1,000,000 and the anticipated year of its letting is 2020.

A) Years between year of estimate and year of letting = 4
B) Inflation Adjustment Percent (3% x 4) = 12%
C) Inflation Adjustment Value ($1,000,000 x 0.12) = $120,000
D) Inflation-Adjusted Construction Cost Estimate ($1,000,000 + $120,000) = $1,120,000

Problem Screening Phase

In programming, federal law requires the transportation improvement program (TIP) for a regional planning area to become part of the state's transportation improvement program (STIP). Therefore the Department and Metropolitan Planning Organization (MPO) work closely to identify the design and construction costs associated with candidate projects to create the TIP. Construction cost estimates prepared during programming of the TIP is critical in terms of setting funding, schedule, and scope for managing project development.

During the Programming and Planning stage, a project cost estimate is provided by the assigned Project Manager and negotiated with Capital Program Development (CPD) during the development of the STIP pool sheets.

The funding level in the TIP sets the budget, and typically includes a target date for construction.

The following tables and examples provide guidance on problem screening phase construction cost estimating for various types of projects based on recent historic bid prices.

As a general rule, the median cost should be used since it represents the project at the center of the range. The reason for using the median over the average cost is that the average cost may be skewed based on an excessively high or low project.

In some cases, when the complexity of the project is known, the low or high costs may be used. For example, when a Resurfacing project is known to have above average ADA work, drainage, intersections, ramps, etc., then a higher than average figure may be used.

Construction Cost Estimating Table
Roadway
(Values updated in year 2016)

Project Category	Units Used for Calculations	Median Cost per Unit	Low Cost	Average Cost	High Cost
Pavement Preservation	Lane-Mile*	$149,000	$94,000	$154,000	$215,000
Resurfacing	Lane-Mile*	$280,000	$162,000	$300,000	$433,000
Roadway Reconstruction	Lane-Mile*	$3,500,000	$1,200,000	$3,300,000	$5,100,000
Centerline Rumble Strip	Mile	$35,000	$16,000	$33,000	$45,000
Median Crossover Protection	Mile	$282,000	$191,000	$332,000	$553,000

* assuming travel lanes only with variable shoulder widths

Estimate the construction cost for a resurfacing project.

Example: A proposed project to resurface a 3-mile stretch of roadway with two 11-foot wide travel lanes and one 4-foot wide outside shoulder in each direction.

First step – consider travel lanes only.

4 lanes x 3 miles = 12 lane-miles

Second step - estimate the project's construction costs using the ranges shown in the table above.

$162,000/lane-mile x 12 lane-miles = $1,944,000 (low end)

$433,000/lane-mile x 12 lane-miles = $5,196,000 (high end)

$280,000/lane-mile x 12 lane-miles = $3,360,000 (median)

Estimate the construction cost for a centerline rumble strip project.

Example: A proposed project to install centerline rumble strip along a 5.0-mile long highway.

Estimate the project's construction costs as a range.

$16,000/mile x 5.0 miles = $80,000 (low end)

$45,000/mile x 5.0 miles = $225,000 (high end)

$35,000/mile x 5.0 miles = $175,000 (median)

Construction Cost Estimating Table

Bridge/ Culvert

(Values updated in year 2016)

Project Category	Units Used for Calculations	Median Cost per Unit	Low Cost	Average Cost	High Cost
Bridge Deck Replacement	Square Foot	$320	$150	$380	$730
Bridge Superstructure Replacement	Square Foot	$400	$230	$530	$1,300
Bridge Replacement	Square Foot	$1,800	$750	$1,900	$3,500
Culvert Replacement	Square Foot	$2,700	$1,300	$2,300	$3,300

Estimate the construction cost for a bridge deck replacement project.

Example: A proposed project to replace a bridge deck of 44 feet by 160 feet.

First step – calculate the deck replacement area in square footage.

44 feet x 160 feet = 7,040 square feet

Second step - estimate the project's construction costs using the ranges shown in the table above.

$150/square foot x 7040 square feet = $1,056,000 (low end)

$730/square foot x 7040 square feet = $5,139,200 (high end)

$320/square foot x 7040 square feet = $2,252,800 (median)

Estimate the construction cost for a culvert replacement project.

Example: A proposed project to replace two existing culverts with the dimensions below:

12 feet (culvert height) by 44 feet (culvert length) and 7.5 feet by 36 feet, respectively.

First step – calculate the total culvert replacement areas in square footage.

(12 feet x 44 feet) + (7.5 feet x 36 feet) = 798 square feet

Second step - estimate the project's construction costs as a range.

$1,300/square foot X 798 square feet = $1,037,400 (low end)

$3,300/square foot X 798 square feet = $2,633,400 (high end)

$2,700/square foot X 798 square feet = $2,154,600 (median)

Construction Cost Estimating Table
Other Project Types
(Values updated in year 2016)

Project Category	Units Used for Calculations	Median Cost per Unit	Low Cost	Average Cost	High Cost
Sign Structure Replacement	Sign Structure (Overhead or Cantilever)	$278,000	$233,000	$291,000	$387,000
Interchange Construction	Interchange	$34,640,000	$18,620,000	$29,840,000	$36,270,000
Intersection Widening	Intersection	$4,740,000	$4,020,000	$5,010,000	$6,540,000
Signalizing an Intersection	4-leg, "T" or "Y" Intersection	$445,000	$290,000	$486,000	$690,000

Estimate the construction cost for a sign structure replacement project.

Example: A proposed project to replace eight existing sign structures (overhead and/or cantilever).

Estimate the project's construction costs as a range.

$233,000/sign structure X 8 sign structures = $1,864,000 (low end)

$387,000/sign structure X 8 sign structures = $3,096,000 (high end)

$278,000/sign structure X 8 sign structures = $2,224,000 (median)

Estimate the construction cost for a project to eliminate an existing at-grade intersection.

Example: A proposed project to replace the existing at-grade intersection with a grade-separated interchange.

The estimated construction cost for this interchange construction project ranges from $18,620,000 to $36,270,000 with a median price of $34,640,000.

Estimate the construction cost of adding left-turn lanes at an intersection.

Example: A proposed operation improvement project to add left-turn lanes at two existing intersections.

Estimate the project's construction costs as a range.

$4,020,000/intersection X 2 improved intersections = $8,040,000 (low end)

$6,540,000/intersection X 2 improved intersections = $13,080,000 (high end)

$4,740,000/intersection X 2 improved intersections = $9,480,000 (median)

Concept Development Phase

For the scoping stage, the goal is for the Designer to review the order of magnitude construction cost estimate developed during the TIP development and determine what additional information is now known regarding the project scope.

At this stage, project design alternatives have been developed and a Preliminary Construction Cost Estimate needs to be developed for each alternative. At a minimum, each estimate, for each alternative, should contain estimated costs for raw construction, right of way and utilities.

The cost estimate for the scoping stage is developed by the project Designer using the Concept Development Cost Estimating Calculation spreadsheets (Attachment 1). The calculation sheets are used to develop a baseline estimate based on seven construction classification and project specifics, such as length, pavement type, and types of bridges. Please note that these sheets are only intended to be used as a reference when developing a construction cost estimate. Current unit prices must be evaluated and engineering judgment employed when utilizing the formulas suggested in the spreadsheets.

Once the scoping stage construction cost estimate has been developed, the estimator should consider what effects the cost drivers will have on the construction cost estimate and adjust the raw numbers accordingly. Additional information on cost drivers is provided in Chapter 4, *Cost Estimating Factors*.

The Designer should also reexamine any amount applied to the TIP estimate that accounted for long-term trends in the various highway construction sectors.

Also developed in the Concept Development phase is the *Concept Development ROW and Access Cost Estimate*. To obtain this estimate, a request is sent to the appropriate ROW Regional Office who provides an estimate of the future ROW funding needs for the proposed project.

A cost estimate for large projects (Environmental Assessment (EA) or Environmental Impact Statement (EIS) level projects) must also be developed when there is money on the TIP for design of projects but the construction of the project is not contemplated until later in the Long Range Plan. It is important to complete a detailed cost estimate in the planning stage for these types of projects which includes inflation to make sure NJDOT could afford to construct the project when the project is projected to be let.

Preliminary Engineering Phase

At this point in the project development, the Preliminary Preferred Alternative has been selected and the design has been advanced to verify the NEPA classification. During the PE phase, additional design work is completed, so the preliminary construction cost estimate developed in the CD phase can be updated. The Designer prepares the Construction Cost Estimate using AASHTOWare. The Designer submits the Construction Cost Estimate to the Project Manager for review and comment. Once finalized, the Project Manager enters the Construction Cost Estimate into the Project Reporting System.

As in the scoping stage, once the raw design stage cost estimate has been developed, then the Designer will need to consider what effects the cost drivers, contingency, and inflation will have on the construction cost estimate.

In addition to the construction cost estimate, the Department also works to *Prepare Initial ROW Estimate* during Preliminary Engineering. To develop this estimate, the Project Manager requests the Division of Right of Way (ROW) and Access Management to develop the Initial ROW Estimate based on the concurred ROW Impact Plan; inclusive of potential sites for reforestation, wetland and riparian buffer mitigation. If specific environmental mitigation parcels have not been identified, an anticipated cost should be included for all environmental mitigation. The Division of ROW and Access Management will develop the estimate and send it to the Project Manager. Once finalized, the Project Manager enters the Initial ROW Estimate into the Project Reporting System (PRS).

Final Design Phase

Several cost estimates are prepared during the FD phase. Near the beginning of the FD phase a comprehensive utility estimate is prepared under the activity, *Prepare Utility Agreement Plans, Specifications and Estimates*. The estimate is prepared utilizing the approved utility relocation checklists and the utility agreement plans.

Toward the end of the FD phase and just prior to the preparation of the Final Design Submission, the Department utilizes estimating software to *Develop Construction Cost Estimate*. This estimate is a detailed itemized estimate utilizing contract qualities and historical bid item prices.

PS&E Development

The Designer prepares and submits the Cost Estimate package to the Project Manager. This estimate is an itemized estimate utilizing contract quantities adjusted as per the Final Design Submission review comments. The construction cost estimate is to be developed using AASHTOWare software and Historical bid-based Estimating, Historical Percentages Estimating, or Cost-based Estimating, as needed.

2.2 NJDOT Cost Estimating Process Summary

The following summary is meant to provide an overview for the NJDOT project cost estimation process:

Table 2.2 – Summary

Estimating Stages	Estimating Phases	Estimate		Estimate developed or Updated	Estimate developed by	Where Estimate is published
		Type	Method			
Programming and Planning	Problem Screening Phase	Conceptual/ planning level estimate	Similar Projects and Historical Percentages	TIP estimate	Capital Project Management	STIP and PRS, Budget Info tab
Scoping	Concept Development Phase	Baseline estimate	Similar Projects and Historical Percentages	Preliminary Construction Cost Estimate	Designer	PRS, Budget Info tab
				Concept Development ROW and Access Cost Estimate	ROW	PRS, Budget Info tab
Design Development	Preliminary Engineering	Mid-level estimate	Cost Estimation System (CES) software	Construction Cost Estimate	Designer	PRS, Budget Info tab
	Final Design Phases	Detailed itemized estimate	Cost Estimation System (CES) software	Construction Cost Estimate	Designer	PRS, Budget Info tab

PS&E	End of Final Design Phases	Completed detailed itemized estimate	AASHTOWare Project Software	PS&E Cost Estimate	Developed by Designer, finalized by NJDOT Estimators	PRS, Budget Info tab

2.3 Estimating Process Background

Regardless of the estimate stage/phase, the preparation of an initial estimate or the update of an estimate at subsequent milestones should follow the basic process shown in Table 2.3, Estimating Steps.

Table 2.3 - Estimating Steps

Step	Description
Determine (or review and update) estimate basis	Document (or update) project type and scope, including: • Scope documents • Drawings that are available (defining percent engineering and design completion) • Project design parameters • Project complexity • Unique project location characteristics • Disciplines required to prepare the cost estimate
Prepare (or update) base estimate	Prepare (or update) estimate, including: • Documentation of estimate assumptions, types of cost data, and adjustments to cost data • Application of appropriate estimation techniques, parameters, and cost data consistent with level of scope definition • Coverage of all known project elements • Coverage of all known project conditions • Ensure that estimates are consistent with past experience
Determine risk and set contingency	Identify and quantify areas of uncertainty related to: • Project knowns and unknowns • Potential risks associated with these uncertainties • Appropriate level of contingency congruent with project risks
Review total estimate	Review estimate basis and assumptions, including: • Methods used to develop estimate parameters (e.g., quantities) and associated costs • Completeness of estimate relative to the project scope • Application of cost data, including project-specific adjustments • Reconciliation of current estimate with the previous estimate (explain differences) • Preparation of an estimation file (hard copies or electronic) that compiles information and data used to prepare the project estimate

2.4 Estimate Documentation

Documenting the construction cost estimate is important in order to clearly understand what is included in the estimate, what the contingencies represent and the associated inflation considered. Proper documentation will allow estimates to be easily checked, verified, and corrected.

To develop a construction cost estimate that is in line with market considerations and eventually the low bid for the project, proper documentation of the estimate throughout the project development process is critical. This documentation is important as project team members contributing to the construction cost estimate are aware of the assumptions that have been made throughout the project and the assumptions that need to be resolved to further refine the construction cost estimate. This includes all assumptions for estimated quantities and unit prices throughout project development, and how the project specific conditions do affect quantities and unit prices for certain types of work on the project.

The estimate is an integral part of the project need and scope, and together cost and scope drive many of the project team's design decisions. All project team members must understand the importance of cost estimation if costs are to be managed appropriately. The project team must avoid misrepresenting the project, in both terms of scope and cost, throughout project development.

Changes in scope or other issues that affect project cost must be documented and resolved in the estimate at key milestones in the project development process. In addition, the estimator must document all estimate assumptions as well as maintain the estimate data and information that supports the quantities, prices, allowances, assumptions and contingencies.

Table 2.4 outlines the basic steps for performing a review and/or update of the construction cost estimate and can be applied at each phase of the project development process.

Table 2.4 - Estimate Documentation Steps *(cont. pg. 9)*

Documentation Step	Description
Monitor project scope and project conditions	Identify any potential deviation from the current construction cost estimate, including: • Changes in project scope • Changes due to design development • Changes due to external conditions • The nature and description of the potential deviation • Deviation impacts on the project budget and/or schedule
Evaluate potential impact of change	Assess potential impact of change, including: • Cost and time impact of the deviation • Recommendation as to whether to modify the project scope, budget, and/or schedule due to change
Adjust cost estimate	Document changes to the baseline estimate, including: • Appropriate approval of the deviation • The new project scope, new budget, and/or new schedule • Notification of the change to project personnel

Obtain appropriate approvals	Obtain authorization to proceed by: • Review of current project scope and estimate basis • Securing approvals from appropriate management levels • Approval of current estimates, including any changes from previous estimates • Release of estimate for its intended purpose and use

2.5 Project Estimate File

Estimates are created by the collaborative effort of many units (e.g., highway, structures, traffic). To be able to follow the assumptions upon which the construction cost estimate is based and to preserve the information for future projects, all estimates and their supporting documentation must be stored in the project estimate file that can be easily accessed by hard-copy or electronically as a folder within the general project file. The Project Manager is responsible for the creation and maintenance of the project estimate file.

A project estimate file provides a record that documents the basic reasons behind the original estimated construction cost, as well as reasons for subsequent construction cost revisions. The project estimate file should, at a minimum, contain the Cost Driver Analysis Form of appropriate categories of work at each project milestone for each cost estimate developed including any assumptions that have been made, the current project scope, and a copy of or reference to the cost data that were used to develop the construction cost estimate. This information should be included in the project estimate file regardless of project development stage—the creation of the file begins with the very first estimate. When items are estimated by percentages or other costs, as is often done for miscellaneous and utility costs, the percentage should also be documented in the project estimate file.

Depending on the point in time in the project development cycle, the amount and type of documentation contained in the project estimate file will vary. Information used to develop the funding estimate, such as cost-per-mile factors or other parametric estimates, should be well documented, and included in the project estimation file. Additionally, any line item prices that are higher or lower from the bid item history costs must be well documented in the project estimate file. Information that may be included in the project estimate file may consist of references to bid tabulation data, unit bid price book data, or some other reputable resources. The estimate file can also provide other project descriptive information, such as trends that affect item(s) cost, cost from similar past projects, and external factors that limit construction operations.

Good documentation supports the cost estimate's credibility, aids in the analysis of changes in project cost, enables reviewers to effectively assess the construction estimate, and contributes to the collection of information for estimating the cost of future projects. Each project's construction cost estimate will be a well-documented history of the assumptions, methods, and procedures used to estimate the costs associated with the project's specific scope of work.

Other Estimate Documentation

At each project development milestone, the level of information must be documented regarding how the estimated cost was obtained to allow an independent reviewer to determine whether the estimate is complete, accurate, and realistic. The following information should be provided at each milestone:

- Item number, name, item description and any tailoring used for this estimate
- Methodology - Describe how the item's costs were estimated (e.g., historical costs, similar project, conceptual costs, parametric estimating)
- The use of unit prices from the Department's historical bid tabs. Under this approach, bid data are summarized and adjusted for project conditions (project location, size, quantities, etc.) and the general market conditions
- How lump-sum items are handled
- Detailed, clear environmental items (requirements)
- How indirect costs are determined
- Each contingency allowance assigned to the various parts of the estimate. If extraordinary conditions exist that call for higher contingencies, the rationale will be documented
- All uncertainties and risks associated with the estimate
- Level of knowledge about scope
- Level of estimate detail
- Techniques used to complete the estimate
- Experience of those who developed the estimate
- Cost traceability - When a prior cost estimate exists, a description of the cost should provide a concise explanation for any cost change to an item from the prior estimate
- Document the names and titles of participants who developed the estimate

Each construction cost estimate placed in the project estimate file should be identified by the date and current project milestone that the construction cost estimate is changed, updated, or reviewed.

2.6 Major Project Program Cost Estimating (>$500M)

The FHWA provides guidance for Major Project Program Cost Estimating available on their website at: www.fhwa.dot.gov/ipd/project_delivery/tools_programs/cost_estimating. A major project is defined as a project that receives any amount of Federal financial assistance and has an estimated total program cost greater than $500 million (expressed in year-of-expenditure dollars). The total program cost estimate includes construction, engineering, acquisition of right-of-way, and related costs. In order to fully represent costs for delivering the project, adjustment for utility and railroad, transportation system management, public outreach, and construction contingencies to allow for additional work and cost growth during construction should all be included as cost elements on major projects. The key principles stressed in the FHWA guidance also apply to other NJDOT projects such as documentation, review, and validation of the estimate, updating the estimate at various development phases of the project, and relying on experts for input into various elements of the estimate.

Section 3 – Cost Estimating Methods

3.0 Introduction

The use of cost estimating methods, software and calculation estimation spreadsheets will depend on where you are in the project development process, the level of project scope definition, the project type, and the complexity of the project. Additionally, there are a variety of cost estimating tools that can be used to support construction cost estimating for each of the methods.

3.1 AASHTO Ware Project Cost Estimation software

The NJDOT uses AASHTOWare Project Cost Estimation software for preparing construction cost estimates to produce more accurate and consistent estimates earlier in the engineering cycle. CES provides a full range of capabilities from concept to the final Engineer's Estimate. As a result, estimators can now produce the final estimate by moving smoothly from long range to detailed information.

The CES module can be accessed remotely. Access the following link for more information:

http://www.state.nj.us/transportation/business/aashtoware/estimation.shtm

3.2 AASHTOWare Project Software (formerly Trns*port)

The NJDOT uses AASHTOWare Project Preconstruction to manage the pre-letting (pre-bidding) phase of the construction program. AASHTOWare Project Preconstruction can import data directly from the Cost Estimation System (CES) to prepare the final estimate for construction projects. It will also be used by NJDOT estimation reviewers to prepare standard reports, proposal forms and other documents for a bid letting package.

The electronic bid letting package produced in AASHTOWare Project Preconstruction will then be available to contractors using the Expedite software to prepare and submit bids over the Internet. Access the following link for more information:

http://www.state.nj.us/transportation/business/aashtoware/

3.3 Historical Bid-Based Estimating

The use of historical data from recently bid contracts is the most common state highway agency estimation approach. Under this approach, bid data are summarized with line items developed for major elements of work so that quantities and historical unit prices can be applied to these line items. The Designer can use Bid Tabs to develop the construction cost estimate for major elements of work so that quantities and historical unit prices can be applied to these line items.

3.4 Analogous or Similar Project Estimating

Analogous project estimating is an estimate that relies heavily on one project that is very similar to the project construction cost that is being estimated. The similar project being used was either previously constructed; is currently under construction; is bid for construction; or has a completed PS&E (plans, specifications, and estimate) level estimate. Line items, quantities, and unit costs are used as a basis for estimating the current project prior to adjusting the construction cost estimate for different project features.

3.5 Historical Percentages Estimating

This method is used in conjunction with historical bid-based estimation. Historical percentages are used to estimate costs for items that are not typically defined early in project development or for lump sum items. A percentage is developed based on historical cost information from past projects to cover certain items that can be derived from bid tabs to cover certain items. This percentage is based on a relationship between the selected items and a total cost category such as direct construction. For example, contractor mobilization is often estimated based on a historical percentage of construction.

3.6 Cost-Based Estimating (scratch estimating)

Introduction: This method relies on the cost-based estimation approach, where the construction cost estimate can be developed based on a projected productivity, along with estimated labor, material, equipment, contractor overhead, and contractor profit for each major cost category or line item.

Cost-based estimating, also known as "scratch" estimating, is a method to estimate the cost of each component to complete a work item and then adding an amount for contractor's overhead and profit. A cost-based estimate can be developed based on a projected productivity, along with estimated labor, material, equipment, contractor overhead, and contractor profit for each major cost category.

A cost-based estimating approach can take into account the unique character of projects, geographical influences, market factors and the volatility of material prices. When an estimate for an item is separated into labor, material, equipment, overhead and profit, it is easier to account for unique project characteristics. For example, special equipment needs or factors that address labor productivity can be documented in a cost-based estimate as opposed to a random increase or decrease of an average unit cost of an item. Since contractors generally utilize a cost-based estimating approach to prepare bids, this method can provide more accurate and defendable costs to support the decision for contract award/rejection.

Properly prepared cost-based estimates require significantly more in terms of effort, time and skill to prepare than historic bid-based estimating. This type of estimate can provide the Department and estimate reviewers a better idea of how much a project should cost but takes a greater commitment of resources to produce the estimate. See Section 3.5.E. on the process for identifying items for cost-based estimating.

Even agencies that routinely utilize cost-based estimates typically do so for only those items that comprise the largest dollar value of the project. Cost-based estimating can be used to check major items of work that pose significant impact on total project cost. In order to successfully implement cost-based estimating, the estimators must have expertise in construction methodologies. The estimator should have a good working knowledge of construction techniques and construction equipment, proposed project work and how it will most likely be accomplished, labor requirements, equipment production rates, scheduling, how much to adjust quotes from material suppliers, potential locations of material sources. Keeping detailed records of actual equipment and manpower production rates on past construction contracts are also helpful for providing data from which to base estimating assumptions for contracts being let.

Cost-Based Process: The following steps are a recommended sequence of activities to be used in determining the estimated cost of an item of work.

1. Identify Items for Cost-Based Estimating Approach
2. Define and List Work Associated with Identified Items.
3. Review construction schedule information.
4. Determine material, equipment and labor requirements.
5. Time (Establish anticipated progress rate).
6. Compute base cost of labor, materials and equipment.
7. Add overhead.
8. Add profit.
9. Compute unit price.

Section 4 - Cost Estimating Factors

4.0 Introduction

Construction cost estimates are developed for key stages in the project development process. These estimates are then used in support of the funding and program decisions. The cost estimate process that is used for each project development milestone must conform to the information that is available at that time. For example, when only preliminary information is available for a project, then conceptual estimation methods must be used to determine planning-level cost projections. Additional cost estimates must be performed as the project is better defined and there are fewer unknowns. Project construction cost estimation is critical during programming because this is when a baseline scope, cost, and schedule are determined. Throughout the remainder of the project development process, the cost estimation tools must produce consistent and accurate estimates.

Development of construction cost estimates for each stage consists of two components: known (or base) amounts and unknown (risk and contingency) costs. Understanding the risks associated with the project, as well as having a clear definition of contingency is very important.

4.1 Cost Drivers

Cost drivers are various items associated with a project that can have an impact, either minimally or significantly, in the construction cost estimate development. The Project Manager must accurately understand and document the impacts that cost drivers are anticipated to have on the construction cost estimate. The following are common cost drivers that must be examined to determine whether they impact a project's construction cost estimate.

Quantity of Materials: - The quantity of a given material on a project affects the unit cost of constructing and/or supplying that item. This is not just a supply and demand issue, but also one of production efficiency and economy of scale.

- **Large Quantities:** Typically, the unit price for larger quantities of a given material will be less than smaller quantities. Suppliers offer discounts for larger quantity orders, as mobilization, overhead and profit are spread out over a larger quantity, thereby reducing the cost on each unit. Larger quantities also give rise to efficiency by gaining experience and expertise in completing the work. However, for very large quantities of certain materials may actually cause an increase to the unit bid price. For example, a project with numerous or large structures may affect the market for a particular type of steel, availability of cement, or even tie up a region's labor resources. Also, the phasing of the project may also negate the cost efficiency of large quantities when those quantities are split between construction project phases.
- **Small Quantities:** Small quantities of items of work are less cost effective to construct and lead to higher unit prices. Not only do suppliers charge more for smaller purchases, in some instances, the lot size or the amount that has to be purchased is greater than the needed quantity. Small quantities do not generally allow for high production rates or other efficiencies, again causing a higher unit cost. Smaller quantity items are also frequently subcontracted out, this practice increases a contractor's overhead and they usually apply a markup to those items.

Classification of Work: Work that must be performed by hand will be more expensive than similar work that can be completed by machine. In addition, separated operations will be more costly than contiguous operations. Finally, precise work, such as fine grade, will cost more per unit than bulk work, such as large fills.

Price-Volatile Materials: Materials are considered price-volatile when:

- Based on monitoring of recent contracts, the price trend is extremely volatile.
- Suppliers provide a price quotation for a limited time frame that is shorter than the duration of the contract.
- The price quote may be based on date of delivery or spot market conditions.
- Potential shortages are possible.

There are times when fuel prices may be considered as volatile. The types of work that are most fuel-intensive are excavation and embankment, aggregate hauling and paving. The cost of asphalt can also be volatile. Also, construction contract terms typically incorporate adjustment factors to account for the volatility of fuel and asphalt prices.

Availability of Materials: The availability or shortage of materials can have a great effect on the cost of a project when developing the construction cost estimate. Material sources should be checked for stock inventory, production rates and limits of supply (e.g., manufactured items such as pipe and traffic signals should be checked for availability and delivery time). Provisions should be made in the construction schedule for sufficient time for the successful bidder to order materials that are known to not be readily available such as steel fabrications, pre-stressed concrete I-beams, pre-stressed concrete box beams, and steel sheet piling.

Material shortages can increase costs, cause construction delays and increase overhead by lengthening the contract time. Surpluses in materials can drive costs down due to competition between suppliers.

Location: The location of a project can also affect the unit bid prices. A project's location, whether in an urban, suburban, or rural setting should be considered in establishing the construction cost estimate. Depending on the specifications associated with the project, some of the cost considerations relating to a project's location may be accounted for in the mobilization bid item.

- **Rural** Projects located in rural settings have factors that affect the unit bid prices contrary to projects located in urban settings. Construction operations may have less restricted work areas, less traffic to contend with, and additional hours to complete the work; all factors that increase productivity. On the other hand, materials, equipment and personnel may all have to be brought to the project site from out of the area, which may increase those costs related to transportation, support, wages, and per diem. Remote locations usually result in higher prices. When developing the construction cost estimate, consider sources of material, mobilization costs to the project site, and availability of local labor.
- **Urban** In congested urban areas, the storage space for contractor's equipment and stored materials must be considered, along with borrow and waste areas if required and haul distances when developing the construction cost estimate. Work that is to be completed while public traffic is maintained will require adjusted rates of progress.

A project in an urban setting generally has to contend with construction operations occurring in more confined work spaces, greater volumes of traffic, limited hours of operations, and night time work that can affect production rates and impact the construction cost estimate. Some of these factors may be offset by availability of local contractors, materials, equipment and personnel.

Time of the Year: The estimate should reflect prices that are realistic for the areas, times and characteristics of the work to be done to account for a seasonal adjustment. The month of the year that work will proceed has a definite effect on the construction cost estimate for the project. It is best to start projects in early spring and/or can be finished before cold weather sets in. If the project cannot be completed before cold weather, rates of progress must be adjusted downward and the construction cost estimate revised upward. In addition, added costs, such as winter overhead, heating of materials and winter damage, must be considered when developing the construction cost estimate. For certain operations, temperature extremes will cause delays and raise costs, therefore, the construction cost estimate must be examined to determine if certain operations will be impacted by temperatures and the cost estimate adjusted appropriately.

Project Type: In the context of cost estimating, project type will influence the associated cost drivers. While new highway construction projects may have additional costs associated with right-of-way acquisition, it may provide more efficient construction access and allow the contractor to use larger equipment. In contrast, reconstruction projects on existing alignment pose construction access restriction and other costs associated with construction phasing and maintaining traffic.

Maintenance and Protection of Traffic: Construction in high-volume traffic areas will add substantially to project duration and construction cost estimate. Similar projects with low-volume traffic areas will have generally shorter contract times. During construction, Maintenance and Protection of Traffic (MPT) should be designed and implemented to minimize the inconvenience placed on motorists driving in high or low-volume traffic areas.

When new roadways are constructed, contractors may build with little interference from existing traffic areas. This situation permits the contractor to generally maximize production rates and minimize expenditures. MPT costs become pertinent when the roadway project requires traffic to be shifted or detoured around the construction site.

Cost-effective MPT must allow the contractor procedures that maximize production rates and work zone safety, while minimizing contract time and impacts on the motoring public. When preparing effective MPT for a project, costs associated with the following items must be considered:

- Half-Width vs. Open Area Construction
- Night vs. Day Construction
- Lane Closures
- Detours
- Mobilization, Demobilization and Remobilization

4.2 Lump Sum Items

The most difficult items to estimate on a project are the lump sum pay items. A lump sum item can be defined as an item that does not have a detailed quantity specified and 100% payout of the item is

virtually guaranteed. Fortunately lump sum items are usually structured so they cannot be overrun. Unfortunately it can be difficult to estimate what cost should go into a lump sum item and what cost a bidder has put into a lump sum item.

From an estimating standpoint, lump sum bid items should not be used. If the work to be performed can easily be quantified, then a payment method that includes a quantity should be used. However, lump sum bid items are often used when an item of work can be defined by a transportation agency in general terms, (i.e., the finished product can be easily defined but not all the components or details can be easily determined). This fact can make estimating lump sum items difficult for the estimator. The more information and breakdown of a lump sum item that an estimator has to work with, the greater the likelihood that an accurate lump sum estimate can be developed. In any case, an estimator should try and define a lump sum in terms of its simplest, most basic components and should consider other factors that may not be easily estimated. By breaking out a lump sum item into smaller items of work that an estimator may have historical data on, and then applying reasonable estimated prices to those sub units, the estimator can more accurately establish a price for the overall lump sum item.

Since breaking out a lump sum item into smaller components is difficult and time consuming, many transportation agencies apply percentages or ranges to some lump sum items based upon historical data for similar project conditions. When determining estimates in these instances, the more consideration that can be given to an item's many components, the greater confidence in determining a reasonable estimated price could be realized.

Cost-based estimating can be very beneficial for lump sum items such as MPT, Bridge Demolition and Removal, Mobilization, and Clearing and Grubbing. To formulate a reasonable cost, the lump sum item has to be broken down into what work is included in that item so a cost can be associated. Lump sum traffic control, for example, can be broken down into how many laborers, equipment and materials will be needed for how long and a cost for the elements considered.

Section 5 – Estimate Review

5.0 Introduction

All project estimates should be reviewed for the validity of their basis; however, the formality and depth of the review will vary depending on the type of project and its complexity. Reviews of construction cost estimates will determine that estimation criteria and requirements have been met and that a well-documented estimate has been developed. In addition, an estimate review can establish that the construction cost estimate accurately reflects the project's scope, items are not missing, that historical data reasonably reflects project scope and site conditions, and that cost driver assumptions are appropriate for the project.

All reviews must closely examine the assumptions that form the basis of the estimate, internal logic, completeness of scope, and estimation methodology. Performing estimate reviews as part of project milestone reviews is an effective method for validating the construction cost estimate and associated assumptions. In addition, it establishes the accuracy and completeness of the estimate. As part of the project milestone reviews, the cost drivers, contingencies, and cost escalation factors must be examined based on guidance given in Chapter 4, *Cost Estimating Factors*.

5.1 Estimate Review

A. Estimate Milestones: Estimate reviews must be conducted at strategic times during estimate preparation to improve accuracy and completeness. Estimate/document reviews should be conducted at each design development phase. These earlier reviews can provide real benefit because they often discern cost drivers that can be addressed by design changes and, in so doing, reduce project cost. A cost estimate should be provided along with the intermediate design phase documents. All projects receive an originator review; however, larger projects usually warrant additional reviews. The first review of the estimate should be conducted by the team that prepared the estimate. This is essentially a screening review that ensures that the math is correct, the estimate is documented, and estimating guidelines were followed.

Construction cost estimate reviews should be conducted at each project milestone during the project development process. The depth of the estimate review at each milestone in project development will vary depending on the type of project and project complexity.

B. Design Document Quality: The plans presentation and quality of the bid documents has a direct impact on the cost estimate. Therefore estimate review should consider project constructability from a contractor's perspective of risk.

The Project Manager should resolve issues if any review comments indicate a conflict between the design documents and the project's scope and/or standards of practice or conflicts within the documents.

The Project Manager should provide a written response to all project estimate/document review comments. Responses to all project estimate/document review comments must be submitted prior to production of the bid documents so as to allow sufficient time for the estimators to properly prepare the PS&E.

Each contract requirement should be stated only one time and in the most logical location in the contract documents. Information in one document should not be repeated in any of the other documents. Each document has a specific purpose and should be used precisely for that purpose. This simplifies the retrieval of information and substantially reduces the possibility of conflicts and discrepancies. Everyone involved with a project benefits from this standardized approach to the placement of information within the construction documents.

During the estimate review, there should also be a check on the quality of any documents used to prepare the estimate, even if the documents are considered preliminary. This is perhaps more important as preliminary design progresses and the plans and specifications are approved. A very effective management approach for establishing the reliability of a cost estimate is to subject the estimate to review and verification.

C. Team Approach: A team approach may also provide a more unbiased review. An independent review by an individual Subject Matter Experts (SMEs) is often appropriate for specialized construction methods.

5.2 Estimate Review Process

The following are steps to be followed in performing the review of a construction cost estimate:

A. Determine Level of Review: The level of estimate review is generally related to project size and complexity and the resources available to perform these reviews. In this step, the Project Manager must determine who should review the construction cost estimate and at what level these reviews should occur.

B. Review of Estimate and Assumptions: The first component of the review will focus on understanding how the construction cost estimate was developed. General assumptions should be reviewed. This information sets the context in which the estimated costs were prepared.

- Verify Completeness and Use of Estimating Information and Data. The estimate scope should be verified so that every item of work to complete the project is captured in the estimate. This step focuses on ensuring that the estimate reflects the scope of the project as described when the construction cost estimate was prepared.
- Further, the review should assess whether quantities, unit prices, and percentages reflect the scope of work, project site conditions, and market conditions. Quantities, calculations and applied unit costs and percentages should be evaluated focusing on the major contributors to the project cost. As part of the project milestone review, the cost drivers, contingencies, cost escalation factors and inflation factors must be reviewed.
- Reconcile the Current Estimate. Differences between a project's current construction cost estimate and previous construction cost estimates should be explained. This is particularly critical when cost increases have occurred.

C. Review of Estimate Documentation: Traceability between the funding construction cost estimate and the current construction cost estimate is critical for explaining why there are changes in project construction costs. This traceability with the funding cost estimate is imperative if changes from the funded estimate require that the programmed cost be adjusted to reflect current estimated construction cost of the project.

This step focuses on compiling all estimate documents and organizing them into a single package to include cost summaries, detailed estimates, estimate basis and assumptions, and quantity calculations of the project. This step also contains a review that the estimating process is followed and the estimate methodology follows department guidelines.

Section 6 – Bid Analysis

6.1 Overview

A proper bid analysis helps to ensure that funds are being used in the most effective manner. FHWA's review of the bids should parallel the NJDOT review. Together both agencies should be assured that good competition and the lowest possible price were received. The FHWA concurrence in award is a critical step in the obligation and expenditure of Federal and State funds. Guidance found in United States Code Title 23 CFR 635.114 requires FHWA highway construction Contracts be awarded only on the basis of the lowest responsible bid submitted by a bidder meeting the criteria of responsibility. For a State delegated federally funded project, the NJDOT acts for FHWA in the bid analysis and award processes but must document their decisions as required by 23 CFR 635.114 in the project files.

A bid analysis, pursuant to 23 CFR 635.114(c), is an examination of the unit bid prices for reasonable conformance with the engineer's estimated prices. The analysis is part of the overall bid review conducted by the NJDOT that also incorporates checks for irregularities in regard to the Department's request for proposals and statutory legal requirements such as signatures of corporate officers, bonding, and Equal Employment Opportunity Certification Statements.

The NJDOT employs a low-bid letting procedure because it does do not know the exact cost (the cost experienced by a Contractor) to complete the project. It is also true that even the Contractor does not know the cost of a project until all work is completed; that is why bids are based on estimates and bid differences vary largely because of operational differences between Contractors. Because of the limitations in predicting project cost, NJDOT must have bid review procedures to ensure that bids submitted by Contractors are reasonably priced. These reviews provide the information and justification necessary for making Contract award/rejection decisions.

Review procedures evaluate the competitiveness of the bid prices offered by bidders. The procedures specifically check for mathematical unbalancing, material unbalancing, and comparative cost. Additionally, Procurement procedures test for patterns of bidding and pricing conduct that seem at odds with competitive behavior such as price fixing, bid rigging, and other forms of collusion including market divisions or allocation schemes.

To verify the competitiveness of a bid and to ensure there has been no exploitation of bid item quantity differences, bid review processes can rely on historical bid databases; unit bid prices from the current letting; project Contract documents; current market conditions; well-documented Engineer's Estimates, and available Contractor pool data. For consistency and security reasons, the bid review must be performed within the NJDOT. The NJDOT staff responsible for reviewing or approving the Engineer's Estimate normally performs the analysis and provides a recommendation based on findings.

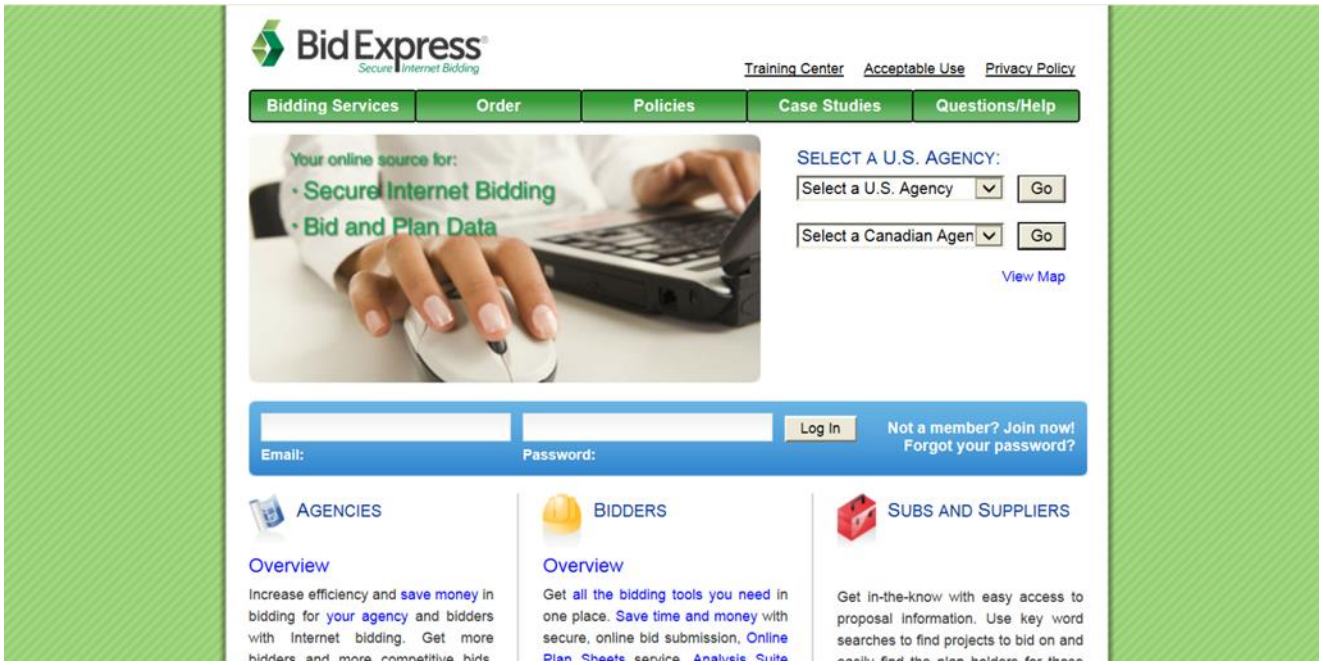
When reviewing bids, the NJDOT evaluates competition and possible issues of constructability, scheduling, document quality, design omissions, and risk transference. Although these issues were most likely addressed during the Final Design Submission, the bidder may have concerns that were overlooked. Another concern is the possibility of unit price unbalancing. Very high and very low bid item prices may point to the possibility of unbalancing within a bid. Using AASHTOWare computer

software, statistical analyses comparing bid items against data in the department's historical bid price database can be done. When variations or indications of possible unbalancing of unit prices are found, an evaluation of the bid is required. It is during this evaluation that a recommendation by the review team is made to award/reject the Low Bidder or re-advertise the project. The final decision is made by NJDOT Project Management and the FHWA.

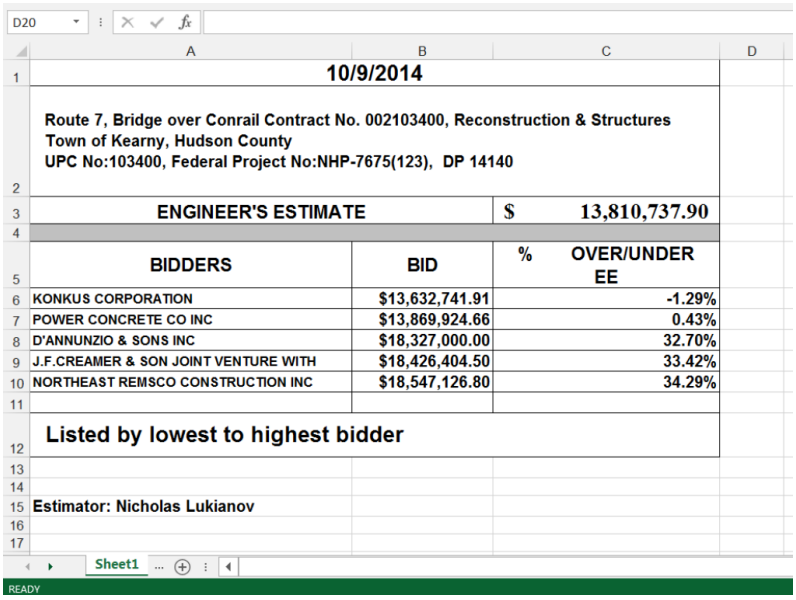
6.2 Bid Review Process

Bid review is the process performed by the NJDOT to justify the award or rejection of the bids and is an examination of the unit bid prices for reasonable price conformance. The purpose of this review is to compare unit bid prices for consistency with price history and current market conditions, and whether adequate competition was obtained. The justification is also used when additional funding is needed for a project and is reviewed by Project Management and the FHWA for concurrence to award approval. It is imperative to submit complete and detailed information in the justification for the project.

The initial part of the bid review involves a bid opening and legal review by the NJDOT Bureau of Construction Services Procurement. The bid and bidders are subject to examination. Amounts and rankings may change in accordance with NJDOT Standard Specifications – Section 102 "Bidding Requirements and Conditions" and Section 103 "Award and Execution of Contract". On the day the project is bid, electronically via Internet on Bid Express, the Bureau of Construction Services Procurement opens, announces and tabulates all bids received.

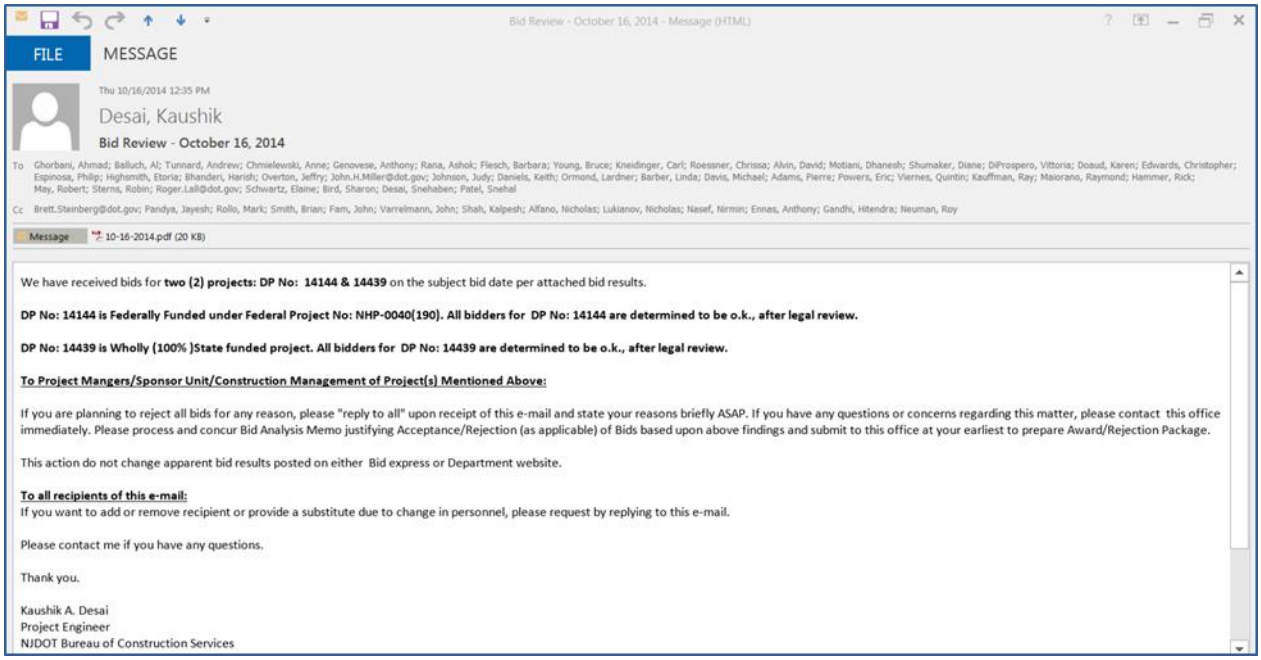


The percentages of each bid above or below the Engineer's Estimate will also be indicated. This information is then distributed by the AASHTOWare unit personnel to senior NJDOT Management, Project Management and Construction Management.



	A	B	C	D
1	10/9/2014			
2	Route 7, Bridge over Conrail Contract No. 002103400, Reconstruction & Structures Town of Kearny, Hudson County UPC No:103400, Federal Project No:NHP-7675(123), DP 14140			
3	ENGINEER'S ESTIMATE		$ 13,810,737.90	
4				
5	BIDDERS	BID	% OVER/UNDER EE	
6	KONKUS CORPORATION	$13,632,741.91	-1.29%	
7	POWER CONCRETE CO INC	$13,869,924.66	0.43%	
8	D'ANNUNZIO & SONS INC	$18,327,000.00	32.70%	
9	J.F.CREAMER & SON JOINT VENTURE WITH	$18,426,404.50	33.42%	
10	NORTHEAST REMSCO CONSTRUCTION INC	$18,547,126.80	34.29%	
11				
12	Listed by lowest to highest bidder			
13				
14				
15	Estimator: Nicholas Lukianov			
16				
17				

The Procurement Bureau, in conjunction with the State Attorney General's office, reviews the bids for conformity and determines which bids are legal, irregular or disqualified. These findings are sent by email to all interested parties involved with the project. See below:



Bid Review - October 16, 2014 - Message (HTML)

FILE MESSAGE

Thu 10/16/2014 12:35 PM

Desai, Kaushik

Bid Review - October 16, 2014

To Ghorbani, Ahmad; Balluch, Al; Tunnard, Andrew; Chmielewski, Anne; Genovese, Anthony; Rana, Ashok; Flesch, Barbara; Young, Bruce; Kneidinger, Carl; Roessner, Chrissa; Alvin, David; Motiani, Dhanesh; Shumaker, Diane; DiProspero, Vittoria; Doaud, Karen; Edwards, Christopher; Espinosa, Philip; Highsmith, Etoria; Bhanderi, Harish; Overton, Jeffry; John.H.Miller@dot.gov; Johnson, Judy; Daniels, Keith; Ormond, Lardner; Barber, Linda; Davis, Michael; Adams, Pierre; Powers, Eric; Viernes, Quintin; Kauffman, Ray; Maiorano, Raymond; Hammer, Rick; May, Robert; Sterns, Robin; Roger.Lall@dot.gov; Schwartz, Elaine; Bird, Sharon; Desai, Snehaben; Patel, Snehal

Cc Brett.Steinberg@dot.gov; Pandya, Jayesh; Rollo, Mark; Smith, Brian; Fam, John; Varrelmann, John; Shah, Kalpesh; Alfano, Nicholas; Lukianov, Nicholas; Nasef, Nirmin; Ennas, Anthony; Gandhi, Hitendra; Neuman, Roy

Message 10-16-2014.pdf (20 KB)

We have received bids for **two (2) projects: DP No: 14144 & 14439** on the subject bid date per attached bid results.

DP No: 14144 is Federally Funded under Federal Project No: NHP-0040(190). All bidders for DP No: 14144 are determined to be o.k., after legal review.

DP No: 14439 is Wholly (100%)State funded project. All bidders for DP No: 14439 are determined to be o.k., after legal review.

To Project Mangers/Sponsor Unit/Construction Management of Project(s) Mentioned Above:

If you are planning to reject all bids for any reason, please "reply to all" upon receipt of this e-mail and state your reasons briefly ASAP. If you have any questions or concerns regarding this matter, please contact this office immediately. Please process and concur Bid Analysis Memo justifying Acceptance/Rejection (as applicable) of Bids based upon above findings and submit to this office at your earliest to prepare Award/Rejection Package.

This action do not change apparent bid results posted on either Bid express or Department website.

To all recipients of this e-mail:
If you want to add or remove recipient or provide a substitute due to change in personnel, please request by replying to this e-mail.

Please contact me if you have any questions.

Thank you.

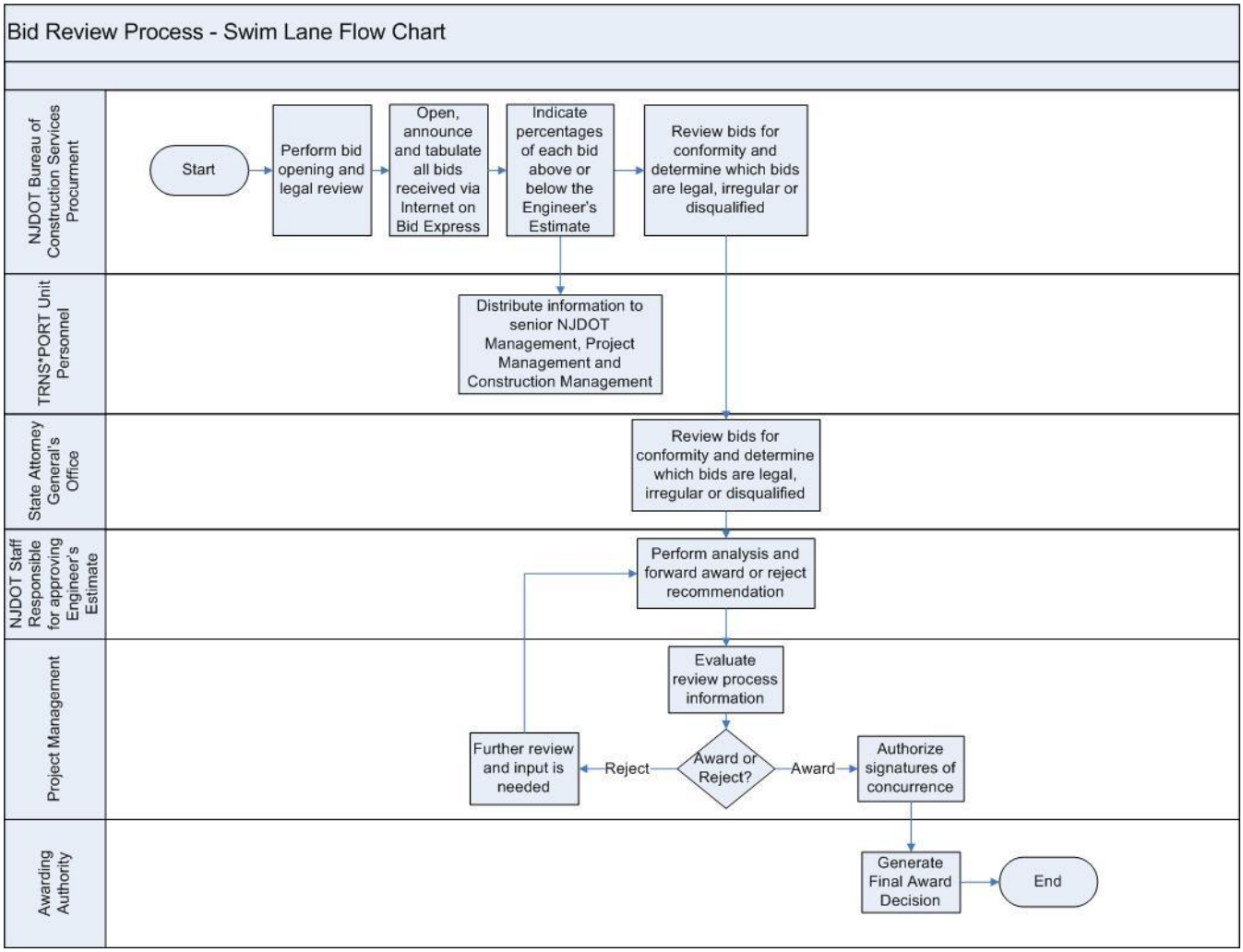
Kaushik A. Desai
Project Engineer
NJDOT Bureau of Construction Services

Upon receiving the email, the NJDOT staff responsible for approving the Engineer's Estimate perform the initial analysis and forwards an award/reject recommendation to Project Management based on findings. The evaluation shall include a quality review of the bid documents and a comparison of additional costs above fair market against the essential need for the project. If the economic recommendation is to award, then the authorization signatures of concurrence by Project Management are done electronically via email. If the recommendation is to reject, then further review and input is needed from Project Management and possibly the design team. In either case, Project Management evaluates the review process information. The awarding authority will make the final award decision.

Decisions to award projects that are above the Engineer's Estimate require substantial justification, including demonstration of an essential need for the work where re-advertising would not be in the public interest. The FHWA publication Federal Guidelines on Preparing Engineer's Estimate, Bid Reviews and Evaluation (January 20, 2004) has classified the following as possibly being essential work:

- Safety projects to correct an extremely hazardous condition where the traveling public is in danger.
- Emergency repairs or replacement of damaged facilities.
- Projects to close substantial gaps in otherwise completed highway facilities to allow opening to traffic.
- Projects that are critical to staged or phased construction where a delay would mean a substantial impact on the completion date of the project.

Anticipation of higher bids is not necessarily considered a justification for award.


Bid Review Process - Swim Lane Flow Chart
NJDOT Bureau of Construction Services Procurment
TRNS*PORT Unit Personnel
State Attorney General's Office
NJDOT Staff Responsible for approving Engineer's Estimate
Project Management
Awarding Authority
Start
Perform bid opening and legal review
Open, announce and tabulate all bids received via Internet on Bid Express
Indicate percentages of each bid above or below the Engineer's Estimate
Review bids for conformity and determine which bids are legal, irregular or disqualified
Distribute information to senior NJDOT Management, Project Management and Construction Management
Review bids for conformity and determine which bids are legal, irregular or disqualified
Perform analysis and forward award or reject recommendation
Evaluate review process information
Award or Reject?
Reject
Further review and input is needed
Award
Authorize signatures of concurrence
Generate Final Award Decision
End

6.3 Competition Adequacy

Competition shall be considered excellent when there are six or more bids within 20% of the low bid, including the low bid. Another interpretation, the low bid and five or more bids above it that fall within 20% of the low bid – a total of six bids that are within a particular range. Fewer competitive bids shall require evaluation to determine whether competition was adequate, and whether additional competition or better prices could be obtained. As a guideline to this determination, the FHWA publication *Federal Guidelines on Preparing Engineer's Estimate, Bid Reviews and Evaluation* (January 20, 2004) offers the following criteria for determining whether adequate competition was obtained:

Number of Competitive Bids* (*Range = Low Bid + 20%)	Competition May Be Considered Adequate When Low Bid Does Not Exceed**
5	120% of Engineer's Estimate
4	115% of Engineer's Estimate
3	110% of Engineer's Estimate
2	105% of Engineer's Estimate
1	The Engineer's Estimate

*** Exceptional types of projects should be identified where competition has been historically poor and when the prospects of increased competition are not apparent. Such projects should be reviewed independently of this or any alternative guideline.*

On occasion, this adequacy guidance seems to be misinterpreted by reviewers, whom assume for example, that they need four bidders within 15% of the Engineer's Estimate for a bid to be competitive. This is not the case. It is easier if you look at the guidance as two separate conditions that have to be satisfied. First on the right column and then on the left.

Example:

Engineer's Estimate has a price of $1,000,000. The Low Bidder has a bid price of $1,140,000. The 2nd Bidder has a bid price of $1,180,000. The 3rd Low bidder has a bid price of $1,300,000. The 4th Low Bidder has a bid price of $1,350,000. The 5th Low Bidder has a bid price of $1,360,000. The first step is to check what the percentage difference is between the Engineer's Estimate and the Low Bidder. The difference between the two is 14%. Find this condition on the right side of the table and move across to the left side. For competition to be adequate we need four or more bids that fall within 20% of the low bid, including the Low Bidder. The Low Bid was $1,140,000. Establishing the range would multiply it by 20% or $1,368,000. Looking at the other bidders they all fall within the range of Low Bidder plus 20%. The aim here is to compare bidders to each other.

The NJDOT considers a sole bidder, whose bid does not exceed the Engineer's Estimate, to be competitive. Although a more comprehensive review is required to check for unbalancing. The Procurement Bureau has a guidance stating that if a sole bidder submits a bid, other plan holders be contacted to ascertain why bids were not submitted. Contacts made with the non-bidding plan

holders may reveal Contractor concerns regarding market saturation, bid document quality, and available bid pool size together with reasons why Contractors chose not to bid on the project.

The initial review of bids involves a comparison of bid totals using AASHTOWare Precon software. The distribution of bid totals compare bids to each other and to the Engineer's Estimate. This distribution can provide insight on competition, project risk, and quality of the project documents. Very large deviations among bidders or with the Engineer's Estimate can indicate an issue with either competition or risk transference to the Contractor.

Competition is reviewed from two perspectives—the current market and the potential bid market. The current market is the group of prime Contractors that obtained plans for a specific project. NJDOT project plan sheets can only be obtained by subscribing to the Bid Express digital plan room. In this case, competition is determined by the comparison of actual bids received from prime Contractors on the plan holder's list. It is possible that Contractors with little backlog will accept work at lower margins in hopes of covering overhead. Conversely, Contractors with a strong backlog frequently demand pricing premiums. Most general Contractors consider a backlog of 6 to 12 months desirable, as long as adequate margins cover overhead and profit.

The potential bid market includes the list of bidders that normally bid work by market sector and work region. Contacting prime Contractors who did not choose to obtain plans can help in revealing market conditions and workload saturations that might not be recognized in the evaluation process. A post-bid review of the documents with non-bidding plan holders can serve to reveal issues of constructability, scheduling, document quality, design omissions, and risk transference. Review of projects with full competition may also be needed for specialty Contract work. In these cases, contacting the high bidder may reveal problems with material costs or specialized equipment and construction techniques that may not have been considered in the development of the Engineer's Estimate.

If the NJDOT decides to re-advertise a project, a forecast of the potential re-bid pool size may be required. In some cases, the re-bid pool might actually be smaller in size. This occurs when a number of higher bidders realize they cannot compete with others and simply choose not to spend the time and money to re-bid a project. In some cases, the timing for a bid is poor, project design is defective, and the documents shift too much risk onto the Contractor. In many cases, a significant price change might only be obtained from a lengthy delay to the re-bid date and substantial change in the design or provisions.

These types of review inquiries can best be conducted by those responsible for the Engineer's Estimate. The reviewer must keep detailed documentation of all competition issues to support the recommended decision to accept or reject a bid but also to support creation of better estimates for future projects.

6.4 Market Review

A significant difference between the Engineer's Estimate and bid prices can indicate issues with either commodity prices, regional work volume, or expected impact of external factors on delivery of materials. With steel, asphalt, and cement being large project cost drivers, local shortages of these items can have a large impact on bid prices. World economic conditions can impact supplies of oil,

diesel, and liquid asphalt and, as a result, drive bid prices. Regional work volume will impact bid prices, driving them either upward when there is excess work or down when there are few projects in a market. Natural disasters have a large influence on regional work volume. Therefore, if there are large discrepancies between a Contractor's bid item cost and the Engineer's Estimate item price, the reviewer must check the documentation that supports the Engineer's Estimate to ensure that the Department adjusted its item cost based on a realistic evaluation of market conditions.

6.5 Constructability Review

Quite often, potential bidders will share their concerns over constructability of the project. Most often, these concerns come from Contractors by means of inquiries on Bid Express during the advertisement period. Information obtained from these sources can serve to focus the constructability review. Schedule restrictions should be evaluated, and it may be determined if bidders incorporated liquidated damages within the bid for unacceptably aggressive schedules.

Overly restrictive traffic control impacts can affect bid costs. Work areas that are too small or unrealistic access to work areas are two constructability factors that can significantly affect bid prices. Remote locations will affect transportation and material costs, as well as labor efficiencies. Small projects in remote locations affect a Contractor's willingness to bid. Small bid pools with high costs can be expected for this type of work.

Bidders have excellent insight into the constructability of a project. After the letting, the NJDOT review team can contact the two or three lowest bidders and seek their view of the project, including concerns that impacted bid prices. The NJDOT estimators cannot negotiate prices with the bidders but simply seek information regarding constructability of the major items of work on the project. Input regarding the quality of plans, schedule, and timing of the project may also be requested. The discussion is simply a chance to gather additional information and gain a different perspective.

6.6 Distribution and Range of Bids

The analysis of the distribution of all bids and a comparison of variations from the Engineer's Estimate is important. The distribution of bidders provides a compelling summary of market conditions and competition relative to the project. Averages of the second, third, and fourth bidders often provide a strong indication of fair market value when evaluating the Engineer's Estimate. Comparisons of the variations of bidders to each other are equally important.

Extremely low prices by one bidder while the other bidders average near the Engineer's Estimate may suggest a problem with the quality of the bid documents (quantity or specification error), or simply a Contractor seeking to build backlog. Other considerations may be that the Contractor has other work near the project site or may have stockpiles of excess materials from other projects.

Larger spreads of bid item distributions will normally occur with specialty work (e.g., bridge cables). For normal projects, such a paving, the larger spreads indicate issues such as restricted sources of material or risk transference due to permits or site access issues. In this case, the Engineer's Estimate may fall within the distribution of the bids. A careful examination of the individual line items may reveal specific issues.

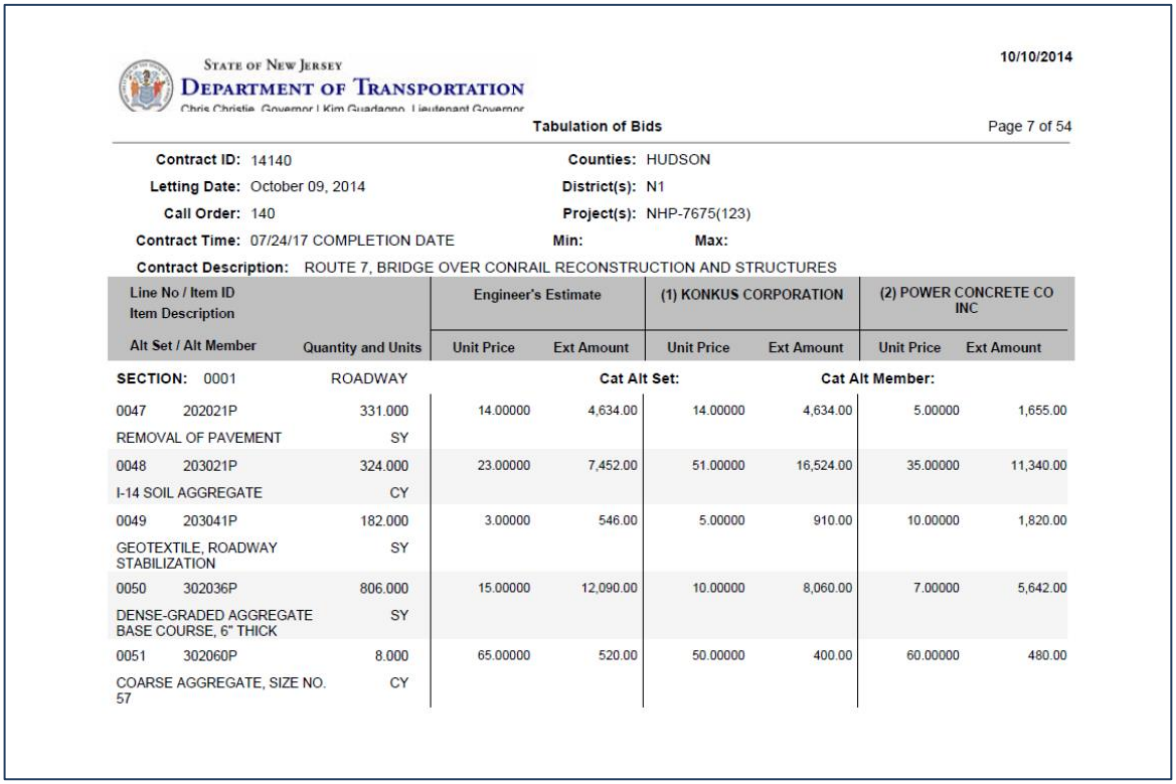
A "low" Bidder Proposal (typically more than 15 percent below the Engineer's Estimate) with all bids normally distributed could indicate a flaw in the project documents (such as insufficient or missing items). The final project costs will probably include change orders that raise total cost significantly. Unbalanced bid prices will help in identifying the line items where quantities require verification.

A "high" Bidder Proposal (typically more than 10 percent above the Engineer's Estimate) with all bids spread approximately as a normal distribution can indicate a shift in market prices. In this case, the historical database structured on past bid item prices must be carefully reviewed. Another possible issue is a Contracting community working at capacity, which can be checked by contacting the Division of Procurement of NJDOT's Construction Services.

A "very high" Bidder Proposal (typically more than 25 percent above the Engineer's Estimate) with all bids normally distributed may indicate a major flaw in the project documents or factors that were not accounted for in the Engineer's Estimate such as an unrealistic construction schedule or permit requirements that add undefined risk and cost to the Contractor.

6.7 High/Low Item Review for Quantity Verification

The selection of bid items for qualitative review is based on identification of line-item costs that are at least higher by 50% or lower by 50% than the Engineer's Estimate **AND** significant to the Contract. Bid item filtering that can easily be performed by computer provides additional insight into unbalanced bid items. The NJDOT uses AASHTOWare Web Precon software to generate a Bid Tab Analysis Report. A step-by-step guide is available. This report displays bid tabulations for the three lowest bidders and includes the Engineer's Estimate for comparison.



STATE OF NEW JERSEY
DEPARTMENT OF TRANSPORTATION
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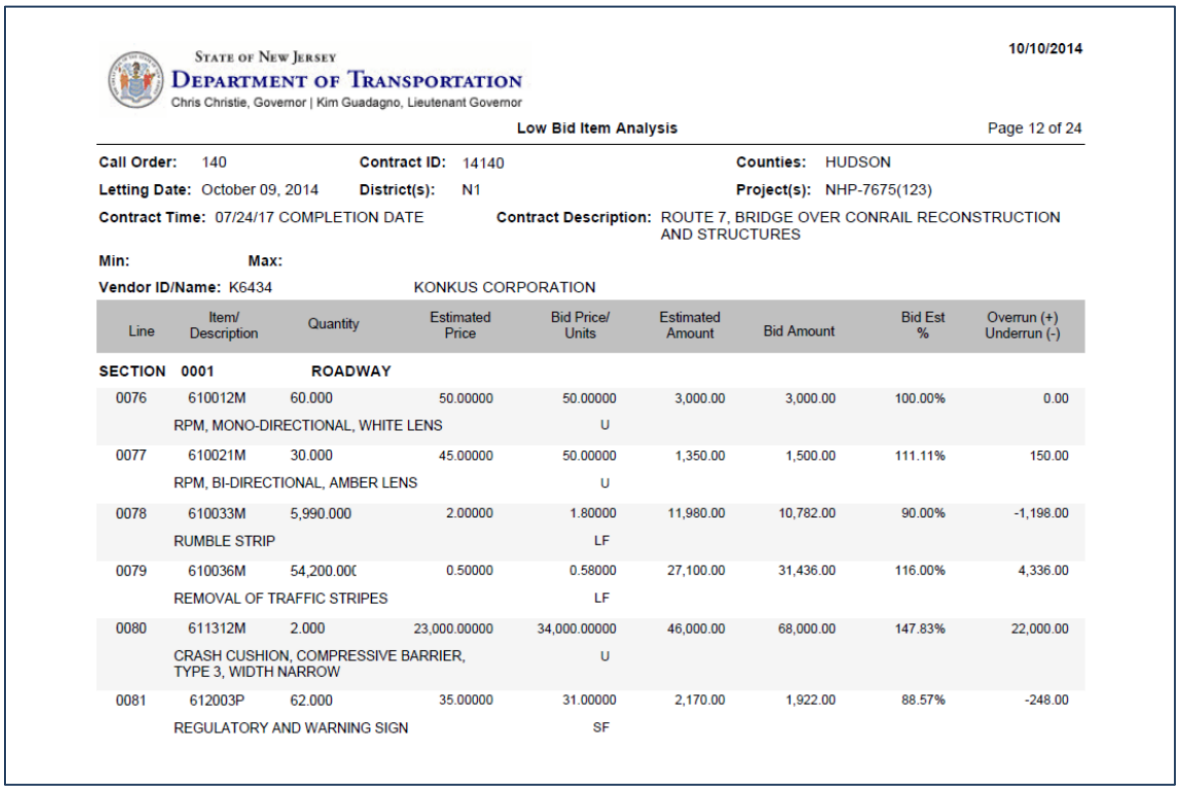
Tabulation of Bids — Page 7 of 54

Contract ID: 14140 **Counties:** HUDSON
Letting Date: October 09, 2014 **District(s):** N1
Call Order: 140 **Project(s):** NHP-7675(123)
Contract Time: 07/24/17 COMPLETION DATE **Min:** **Max:**
Contract Description: ROUTE 7, BRIDGE OVER CONRAIL RECONSTRUCTION AND STRUCTURES

Line No / Item ID / Item Description / Alt Set / Alt Member	Quantity and Units	Engineer's Estimate		(1) KONKUS CORPORATION		(2) POWER CONCRETE CO INC	
		Unit Price	Ext Amount	Unit Price	Ext Amount	Unit Price	Ext Amount
SECTION: 0001 ROADWAY			**Cat Alt Set:**			**Cat Alt Member:**	
0047 202021P REMOVAL OF PAVEMENT	331.000 SY	14.00000	4,634.00	14.00000	4,634.00	5.00000	1,655.00
0048 203021P I-14 SOIL AGGREGATE	324.000 CY	23.00000	7,452.00	51.00000	16,524.00	35.00000	11,340.00
0049 203041P GEOTEXTILE, ROADWAY STABILIZATION	182.000 SY	3.00000	546.00	5.00000	910.00	10.00000	1,820.00
0050 302036P DENSE-GRADED AGGREGATE BASE COURSE, 6" THICK	806.000 SY	15.00000	12,090.00	10.00000	8,060.00	7.00000	5,642.00
0051 302060P COARSE AGGREGATE, SIZE NO. 57	8.000 CY	65.00000	520.00	50.00000	400.00	60.00000	480.00

Moreover, the second section of the report lists unit bid price percentage overruns and underruns. This section, named Low Bid Item analysis, compares the lowest bidder to the Engineer's Estimate.



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Low Bid Item Analysis

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Call Order: 140 **Contract ID:** 14140 **Counties:** HUDSON
Letting Date: October 09, 2014 **District(s):** N1 **Project(s):** NHP-7675(123)
Contract Time: 07/24/17 COMPLETION DATE **Contract Description:** ROUTE 7, BRIDGE OVER CONRAIL RECONSTRUCTION AND STRUCTURES
Min: **Max:**
Vendor ID/Name: K6434 KONKUS CORPORATION

Line	Item/ Description	Quantity	Estimated Price	Bid Price/ Units	Estimated Amount	Bid Amount	Bid Est %	Overrun (+) Underrun (-)
SECTION	**0001**	**ROADWAY**						
0076	610012M	60.000	50.00000	50.00000	3,000.00	3,000.00	100.00%	0.00
	RPM, MONO-DIRECTIONAL, WHITE LENS			U				
0077	610021M	30.000	45.00000	50.00000	1,350.00	1,500.00	111.11%	150.00
	RPM, BI-DIRECTIONAL, AMBER LENS			U				
0078	610033M	5,990.000	2.00000	1.80000	11,980.00	10,782.00	90.00%	-1,198.00
	RUMBLE STRIP			LF				
0079	610036M	54,200.00(	0.50000	0.58000	27,100.00	31,436.00	116.00%	4,336.00
	REMOVAL OF TRAFFIC STRIPES			LF				
0080	611312M	2.000	23,000.00000	34,000.00000	46,000.00	68,000.00	147.83%	22,000.00
	CRASH CUSHION, COMPRESSIVE BARRIER, TYPE 3, WIDTH NARROW			U				
0081	612003P	62.000	35.00000	31.00000	2,170.00	1,922.00	88.57%	-248.00
	REGULATORY AND WARNING SIGN			SF				

Using this Bid Tab Analysis Report, a determination can be made as to which "HIGH" or "LOW" items are "significant/major" and need to be reviewed by the Designer for quantity verification. The guidance is as follows:

An individual bid item will be considered "significant/major" to the Contract if the total extended cost of the bid item makes up a percentage (%) greater than:

- **4% for Contracts below $5,000,000.**
- **3% for Contracts that range from $5,000,001 to $20,000,000.**
- **2.5% for Contracts that range from $20,000,001 to $50,000,000.**
- **2% for Contracts above $50,000,000.**

Example:

The bid item in question has a unit price of $40/CY and the Engineer's Estimate has a unit price of $25/CY. The total cost for that item is $800,000 and for the Engineer's Estimate $500,000. The Low Bidder submitted a total bid price of $6,000,000 for the project. $800,000 divided by $6,000,000 and expressed as a percent would be 13.3%. That is higher than the 3% minimum. The item would be considered "significant" or "major".

An individual bid item will be considerably higher/lower if the difference between the Low Bidder's unit price and the estimate, expressed as a percent of the estimate, is greater than 50% or lower than 50%.

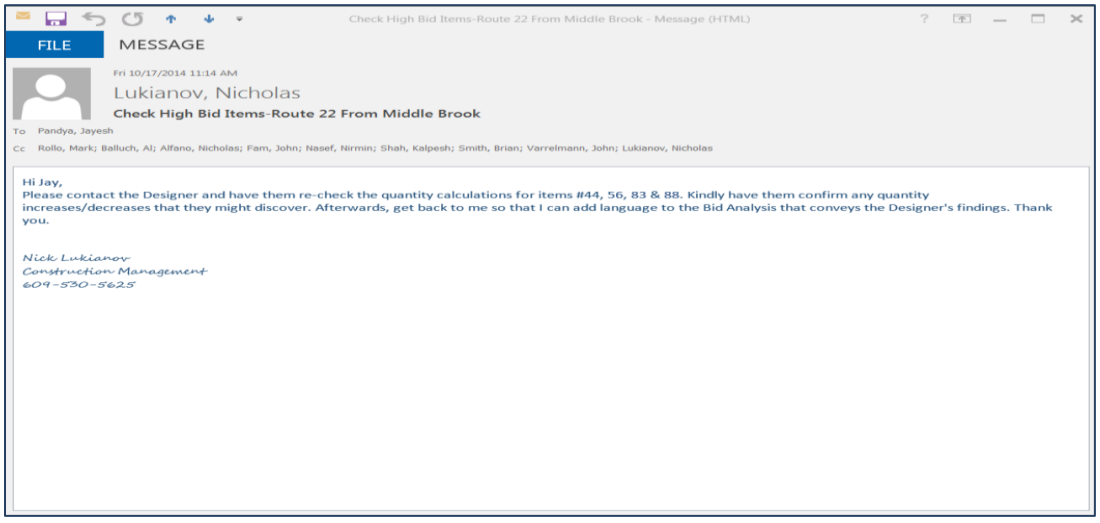
Example:

The Low Bidder submitted a unit price of $19/LF and the Engineer's Estimate has a unit price of $10/LF. The difference of $9 would be the positive cost overrun and the percentage would be +90%. This would be a high item because it is greater than +50%.

Any items that are both significant/major to the Contract <u>AND</u> higher than 50% or lower than 50% need to have the quantities verified by the project Designer.

Quantity verification, triggered by apparent unit price unbalancing, involves contacting the project Designer to review quantities and provide written verification. The 2012 NJDOT guidance from the Director of Construction Services & Materials, states *"…in conjunction with "FHWA Guidelines on Preparing Engineer's Estimate, Bid Reviews and Evaluation", requires that any unit price items that are bid "high" or "low" by the apparent Low Bidder be checked for overruns/underruns and possible quantity errors. The main concern of our agency is to assure itself that the bids have not been materially unbalanced in order to take advantage of errors in the plans or specifications. If these quantities increase during the life cycle of the project they may significantly impact the overall cost. The NJDOT examines significant items that are mathematically unbalanced (as identified by a certain percentage over or under the engineer's estimated unit price for that item). If it appears that a quantity error may have caused a Contractor to unbalance, the State will examine all significant bid items for quantity errors"*.

Further, *"Estimators will request that the Project Managers direct Designers to re-check their quantity calculations for all "high" or "low" bid items found to be significant to the Contract. Lump Sum items need not be checked. If significant quantity errors are found, Estimators will examine the impact on the bidder ranking if corrected quantities had been used. A change in the ranking of the bidders is an indicator of a materially unbalanced bid. If there is a substantial increase in project cost, Project Managers must be notified. The estimator will add/document Designer's findings to the Bid Analysis report and make a recommendation to the FHWA (if applicable) and Procurement. An email from Designer to Estimator and Project Manager will suffice as documentation for quantity checks"*.



6.8 Mathematically Unbalanced Bids

Unbalanced unit pricing involves the shifting of dollars between items by the Contractor coupled with some discounting of the total price for competitive advantage. In the extreme, a Contractor can bid significantly above costs with the knowledge that the changes in quantities will provide increased profits. The root cause of the unbalance is generally, but not always, an inconsistency between the bid summary quantity sheet and the true scope of work. Preemptive language to Contractors looking for increased profits can be found in Section 104.03.03 of the NJDOT 2007 Standard Specifications. For minor changes in quantity, the NJDOT will make payment at the bid price for the item. For major increases in quantity, the Department may request to renegotiate the price for the quantity in excess of 125 percent of the Proposal quantity. For major decreases in quantity, the NJDOT may renegotiate the price. If a mutual agreement cannot be reached on a renegotiated price, the Department will make payment by force account as specified in 104.03.08.

To detect mathematical unbalancing, which is when a price does not reflect a reasonable cost, the Low Bidder's items must be evaluated for nominal conformance with the Engineer's Estimate item prices and additionally compared against other bids that were received. The NJDOT has two types of criteria for determining if an item is significantly unbalanced. This depends on whether or not an item is a "minor" or "major" Contract item (see Section 6.7). The NJDOT identifies significantly mathematically unbalanced items as major work items that are a certain percentage over (+50% or greater) or under (-50% or lower) the Engineer Estimate's unit price for that item. All "minor" items (not significant to contract) that are 100% above or 75% below the Engineer's Estimate are considered to be mathematically unbalanced as well and may be mentioned in the Bid Analysis if the reviewer deems them as viable reasons for bid inconsistencies. At a minimum, "major" Contract items need to be mentioned in the Bid Analysis and more emphasis placed on them.

The degree of mathematical unbalancing of a bid may depend on the reason for the unbalancing such as the following:

(1) "Front Loading" the Contract. This is accomplished by the bidder overpricing the work done early in the project which provides more cash flow at the beginning of the project.
(2) Maximize Profits. This is accomplished by overpricing bid items the Contractor believes will be used in greater quantities than estimated in the proposal and underpricing items the Contractor thinks will be used in significantly lesser quantities.
(3) The Contract may include bid items that lend themselves to unbalancing. As an example, a specification may call for specific items to be paid for by the hour, such as a roller for compacting embankment and water to aid compaction to be paid for by the gallon. In this case, it may be better to set up the bid item as "Embankment, Compacted," paid by the cubic yard. The roller and water usage would be necessary but incidental to the bid item. Another example which may encourage unbalancing is the establishment of bid items for equipment hours or activity hours which in all likelihood will not be needed.

When a low bid contains "Token Bids" (i.e., bids with large variations from the Engineer's Estimate such as "penny" or "dollar"), it must be considered a mathematically unbalanced bid and further evaluated. There may be situations where the quantity of an item could vary due to inaccuracies in the estimating, errors in the plans, changes in site conditions or design. In such situations, the bids

must be further evaluated to determine if the Low Bidder will ultimately yield the lowest cost. If unbalancing creates reasonable doubt that award would result in the lowest cost, the bid is materially unbalanced and may be rejected or awarded to another bidder. All token bids need to be analyzed and discussed in the Bid Analysis.

6.9 Materially Unbalanced Bids

An unbalanced bid may be mathematically unbalanced, or the bid may be mathematically and materially unbalanced. While mathematically unbalanced bids are not prohibited, evidence of a mathematically unbalanced bid is the first step in discovering that a bid is materially unbalanced. A materially unbalanced bid is defined as a bid that fails to provide the NJDOT with the lowest ultimate cost for the project. An increase in project cost can happen because the bidder has increased the prices for items that will likely overrun.

The distinction between a mathematically unbalanced bid and a materially unbalanced bid is determined by examining "major/significant" items that are mathematically unbalanced. If it appears that a quantity error may have caused a Contractor to unbalance, the NJDOT will examine all significant bid items for quantity errors. If quantity errors are found, the NJDOT will examine the impact on the bidder ranking if corrected quantities had been used. A change in the ranking is an indicator of a materially unbalanced bid.

A materially unbalanced bid analysis will only be performed under three circumstances:

(1) If the Department becomes aware of an error in the estimated quantity of a bid item (see Section 6.7).
(2) If a bid item is found to be "significant/major" to the Contract.
(3) If a bid item is found to significantly unbalanced.

Repeating the benchmarks:

(1) **An individual bid item will be considered "significant/major" to the Contract if the total extended cost of the bid item makes up a percentage (%) greater than:**

- **4% for Contracts below $5,000,000.**
- **3% for Contracts that range from $5,000,001 to $20,000,000.**
- **2.5% for Contracts that range from $20,000,001 to $50,000,000.**
- **2% for Contracts above $50,000,000.**

(2) **An individual bid item will be considerably significantly unbalanced if the difference between the Low Bidder's unit price and the estimate, expressed as a percent of the estimate, is greater than +50% or is less than -50% for major items.**

If the NJDOT incorrectly states quantities in the bid documents, the corrected quantity must be used to calculate the corrected total bid for each Contractor. If the order of bidders changes after the corrected quantities are applied, the procurement is normally deemed defective and all bids may be rejected. If no change to the order of bidders exists, the recommendation for award must indicate the bid was mathematically unbalanced but not materially unbalanced. If the initial Contract low bid

proposal is found to be not materially unbalanced to the potential detriment of the NJDOT, the Contract will be considered for award at the bid amount in accordance with the Standard Specifications. The Contract will be based upon the Contract total bid amount and the quantities shown in the bid proposal.

6.10 Lump-Sum Price Comparison

Comparisons of project specific lump-sum items based on bid history analysis can be difficult as these lump-sum items tend to be unique to the project type. A lump-sum item is a single item included in the Contract for work that otherwise would be made up of multiple work items. The grouping of multiple items may be done for efficiency of administration or because it is difficult to quantify the individual items. The interpretations of bid practices that constitute unbalancing are left to the reviewing individual. A mathematically unbalanced bid is defined as a unit price or lump-sum bid that does not reflect a reasonable actual cost plus a reasonable proportionate share of the bidder's anticipated profit, overhead costs, and other indirect costs. These bid items utilize a reference quantity to assist in the development of a total cost from standard unit prices for the bid item. A much stronger grouping of bidder cost distributions is needed before quality control assessment of quantity and risk can be made. Conversely, the Contractor is locked into an all-encompassing price and this transfers the risk of some cost increases to the bidder and not the department.

In the case of standard lump-sum items, comparisons are extremely difficult, as reference quantities are usually not provided to assist in the development of the lump-sum total cost using standard unit prices. This type of bid item does not usually exhibit a tight distribution of bidders' prices. The Engineer's Estimate is generally based on some experienced evaluations from the Designer based on past projects. This type of bid item usually requires a very strong and prescriptive specification. The Engineer's Estimate must contain comprehensive documentation on how the lump-sum price was developed. Some items are priced using tables found in the NJDOT Construction Cost Estimating Guidelines. For example, Performance and Payment Bond, Final Cleanup, Construction Layout, Progress Schedule, and Clearing Site. The project Designer may be consulted for input as to why a lump-sum item may have major variations and these findings may be added to the Bid Analysis.

6.11 Review Team Recommendation

Recommendations for award must include information related to mathematical unbalancing and material unbalancing. The following items must be considered in a recommendation to award:

- Identify project information, number of bidders, and percentage cost comparison to the Engineer's Estimate.
- Competition Requirements
- Provide executive summary of accuracy of bid quantities and selection of bid items.
- Identify individual bid factors with high impact from the review of Contractor bids.
- Provide a summary report of price comparisons (filter review items).

Recommendations to reject must include information related to mathematical unbalancing or material unbalancing and a review of the issues related to the cause for the rejection of the bid. Competition must be cited as well. There may be many reasons cited for rejection, each having its

own weight for supporting the decision. If appropriate, a recommendation of corrective action to the documents and bid process may be included with the rejection. The following items must be considered in a recommendation to reject:

- Identify project information, number of bidders, and percentage cost comparison to the Engineer's Estimate.
- Provide executive summary of conditions and quality of the bid, complexity of the project, competitiveness of the bidding, and degree of unbalancing in the bids.
- Provide executive summary of accuracy of bid quantities and selection of bid items.
- Provide summary report of price comparisons.
- Provide recommendations for changes to bid documents.
- Provide cost assessment of risk transfer to the Contractor based on the level of quality of the project design.
- Identify individual bid factors with high impact from Contractor bids.
- Determine the potential for changes to the project that would result in savings if the project were re-advertised.
- Propose ways to repackage the project with the aim of encouraging competition.
- Determine if the economic conditions would be different and could result in lower bids if the project were rejected and re-let, such as market conditions, Contractor workload, temporary material shortages, etc.
- Determine if there was sufficient time allowed for the Contractor to construct the project.
- Explain how rejecting all bids and changing the Contract period will encourage lower bids.

6.12 FHWA & NJDOT Requirements

A Bid Analysis is required for every project advertised by the NJDOT. Every low bid proposal is analyzed separately and against historical pricing data or estimate data using cost-based methodologies to determine if it appears to represent unusual pricing. The FHWA guidance states that *"the analysis and award process for a project should be thorough even when the low bid is below or at a reasonable percentage above the Engineer's Estimate. It is reasonable, however, to expect that larger projects will receive a more thorough review than very small projects"*.

The procedures for reviewing and awarding construction Contracts are significant components of the competitive bidding process. To ensure a competitive Contracting environment, the NJDOT must have effective and consistent bid review and award recommendation procedures. The procedures must be transparent in a manner that is publicly understandable, economically efficient, and legally defensible.

Review procedures serve to ensure a fair and reasonable price has been bid for performance of the work described. Establishing a consistent and reliable bid review process is also critical for detecting collusive behavior and ensuring the success of preparing estimates for future projects. FHWA guidance states, *"The DOT should have written procedures for justifying the award of Contract, or rejection of the bids, when the low bid appears excessive or rejection is being considered for other reasons"*.

The level of analysis depends on the competition and extent of unbalancing of the items. Federal requirements mandate minimum performance measures, and the NJDOT establishes additional measures to continuously improve the estimating process.

For Federal-aid projects, bid justification must be completed if the low bid exceeds the Engineer's Estimate by more than 10%. Normally, the Department does not justify underbidding unless it is significantly under the Engineer's Estimate (more than 10% under). This guidance assumes that the majority of items are balanced. If bid items are unbalanced a justification needs to be included in the bid analysis. This does not change the necessity of the bid analysis but instead refers to the necessary concurrence. If a low bid proposal is competitive, concurrence is not needed from the FHWA. If a project is designated as a Non-PoDI (Project of Division Interest), then, according to the Stewardship Agreement signed June 16, 2015, the State accepts responsibility for concurring the award of the Contract. If a project is designated as PoDI (Project of Division Interest), concurrence is required regardless of competition. Federal Guidelines on Preparing Engineer's Estimate, Bid Reviews and Evaluation (January 20, 2004) specify that for 50% of all yearly Federally-funded projects and for all Federal Oversight projects, the Engineer's Estimate should be no more than 10% over or under the low bid. If these yearly requirements are not met, the Department must complete a bid justification analysis and provide the results to the FHWA for review and approval. This justification is handled by Project Management and is a different analysis than the one outlined in these guidelines.

For projects involving state funds, the Department's requirements specify the Engineer's Estimate should be no more than 10% over or 15% under the low bid. These requirements are the goals set forth by the Department and should be the target of any good Engineer's Estimate.

6.13 Components of a Written Bid Analysis

Beyond the comparison of prices, the components that make up a written bid analysis include:

- Bid Analysis addressed to the Manager of Construction Services
- Team Leader of Review Team, Construction Management or similar
- Subject line must match Key Sheet Description
- Estimate confidentiality statement
- Date and number of bids received
- Identity of the bidders
- Distribution or range of the bids including percent and cost differences
- Competition assessment per Federal Guidelines on Preparing Engineer's Estimate, Bid Reviews and Evaluation (January 20, 2004)
- Office opinion of award or rejection
- Written analysis of unbalanced items priced lower/higher than Engineer's Estimate. Reference all that were listed in the attached analysis tables. Items to be mentioned in Bid Analysis will be determined as follows:

    (1) All TOKEN bids (penny or dollar).

    (2) All MAJOR items that are 50% above or 50% below the Engineer's Estimate.

(3) Any MINOR items that are 100% above or 75% below the Engineer's Estimate that the reviewer deems essential to mention.

(4) Justification for significant bid price differences. Address current market conditions and workloads.

- Written analysis of any unique findings (if applicable).
- Category comparison table of Engineer's Estimate and two lowest bidders. This provides a quick confirmation that the correct items were focused on in the analysis.
- Conclusion to award or reject based on findings. Discuss any pertinent project details, schedules, findings.
- Show amount of Non-Participating costs based on Low Bidder's proposal. This will be in its own category and can quickly be found in the category comparison table. **Not Needed for 100% State Funded Projects**.
- Show amount of Non-Contract Construction Engineering/Inspection cost (from the Estimate Summary Sheet) for this project**. Not Needed for 100% State Funded Projects**.
- Copy all pertinent Directors, Program Manager, Managers, Funding Unit.

6.14 Components of an Analysis Table

The components that make up a bid analysis table include:

- Item Number - use the sequence number not the standard item number. The sequence number is the number assigned to that line item in the Engineer's Estimate and proposal.
- Item Description – the specific item description as shown on standard item list.
- Contract Quantity – the quantity bid on by the bidder. Check that these are the latest amounts after all Addenda and Amendments in proposal. Lump Sum is shown as LS. Dollar is shown as DOLL.
- Unit Price & Total Price (extended) – unit prices for Engineer's Estimate, Low Bidder, and Second Low Bidder. In some detailed analyses, more bidders may need to be compared. Check that Excel formula is reading Lump Sum/Dollar as a value of 1 for unit price.
- For large amounts of items, the sheets can be split into a Table A and a Table B. One for all the high items and one for all low items.

6.15 Components of an Award/Rejection Memo

The components that make up an award or rejection memo include:

- **Memo not needed for 100% State funded projects**
- Memo addressed to the Manager of Construction Services
- Team Leader of Review Team, Construction Management
- Subject line must match Key Sheet Description
- Identity of the Low Bidder
- Amount of bidder's Contract amount
- Office opinion of award or rejection

- Narrative citing whether or not bid was mathematically unbalanced, materially unbalanced, competition adequate, need for concurrence. For PoDI projects requiring FHWA Full Oversight, concurrence is needed in any situation.

6.16 Bid Analysis "Quick Start" Guide

A quick start guide to bid analysis:

- Approximately 24 hours before bid date send Bid Opening Memo to NJDOT Construction Services-Procurement. See sample.
- On bid day, receive bid results from AASHTOWare Team and wait for legal review. Review addenda for any pertinent questions or concerns. Review scope of work for project.
- Receive email from Procurement with legal review results. Assess competition.
- Run Bid Analysis Report in WebT using step-by-step guide.
- Using % determinations of the Contract, determine which items are significant.
- Determine which unit prices are "high" by 50% or greater or "low" by 50% or greater.
- Send email to Project Manager requesting that Designer verify quantities of all significant high and low items. Not necessary for lump sum items.
- Determine all the low unit price, significant, minor, and token bids.
- Prepare Analysis Table.
- Prepare written Bid Analysis and incorporate Designer findings on high items.
- If Federal, add Non-Participating and CE/CI or State Inspection costs to Analysis. If State, not necessary.
- If Federal, prepare Award/Rejection Memo.
- Send email to Project Manager, Program Manager with attachments for Bid Analysis, Table and Award Memo.
- Project manager concurs and forwards by email to Construction Services.
- If FHWA has concerns, additional justification, letters and rewrites may be necessary. This is done in concert with Project Manager.

Sample - Bid Opening Memo:

NEW JERSEY DEPARTMENT OF TRANSPORTATION
Division of Capital Program Support
MEMORANDUM

TO: Anthony Genovese
Keith Daniels
Quentin Viernes
Bruce Young
Bureau of Construction Services

FROM: Nick Lukianov
Bureau of Construction Management

PHONE: 530-5625

DATE: October 7, 2014

SUBJECT: **Bid Opening Memorandum for Project:**
ROUTE I-80 EASTBOUND
From West of Route 280 to East of Two Bridges Road
Contract No. 046113350
Townships of Parsippany-Troy Hills & Montville in the County of Morris
Fairfield Township in the County of Essex
Wayne Township in the County of Passaic
Federal Project No. NHP-080-5(105)
DP No. 14143

The Engineer's Estimate for the above referenced project being bid Thursday is:

TOTAL **$14,223,978.00**

There were 2 addenda issued on this project.

cc: S. Patel, J. Varrelmann Team, A. Balluch, P. Adams, D. Hecht, J. Shanoskie, R. May, J. Stevenson

Sample - Bid Analysis #1 – Comprehensive Case

NEW JERSEY DEPARTMENT OF TRANSPORTATION
MEMORANDUM

TO: Keith Daniels
Manager, Construction Services

FROM: John Varrelmann
Bureau of Construction Management

DATE: May 8, 2014

PHONE: 530-2377

SUBJECT: **BID ANALYSIS**
Route 18, Bridge over Route 1
Contract No. 040096440
Grading, Paving and Structures
City of New Brunswick Middlesex County
Federal Project No.: NHP-0029(171)
DP Number: 14102

Any Estimate should be considered confidential and should only be made available to Department personnel on a need to know basis.

On April 29, 2014, two (2) bids were received on the above captioned project. The bids were as follows:

No. BIDDERS		BID PRICE	COST DIFFERENCE	PERCENT DIFFERENCE
State	Engineer's Estimate	**$23,173,748.50**		
1	ANSELMI & DECICCO INC.	**$28,444,624.10**	**$5,270,875.60**	**22.75%**
2	TARHEEL ENTERPRISES INC.	**$32,573,581.17**	**$9,399,832.67**	**40.56%**

In the opinion of this office, the Low Bid of $28,444,624.10, which was 22.75% over the Engineer's Estimate (Engineer's Estimate = $23,173,748.50 vs. Low Bid = $28,444,624.10) is acceptable. It is recommended that the project be awarded.

Written Analysis:

The difference between the Engineer's Estimate and Low Bid was +$5,270,875.60.

The Engineer's Estimate was developed using the average weighted prices and bid history for a project of this type and size in this region of New Jersey. The Engineer's Estimate utilized the guidelines provided in the AASHTOWare software documentation for cost justifications. Specially, the Lump Sum Tables found in the NJDOT Construction Cost Estimating Guidelines for items such as Performance and Payment Bond, Final Cleanup, Construction Layout, Progress Schedule, and Clearing Site.

The "NJDOT 2015 Cost Estimating" guidance necessitates that any "MAJOR" unit price items submitted by the apparent Low Bidder be checked for overruns and possible quantity errors. Quantity verification, triggered by apparent unit price unbalancing, involves contacting the project Designer to review quantities and provide written verification. The Designer has verified the quantities in question.

"MAJOR" items are defined as having met <u>two</u> conditions:

(1) An individual bid item will be considered "significant/major" to the Contract if the total extended cost of the bid item makes up a percentage (%) greater than:

- 4% for Contracts below $5,000,000.
- 3% for Contracts that range from $5,000,001 to $20,000,000.
- 2.5% for Contracts that range from $20,000,001 to $50,000,000.
- 2% for Contracts above $50,000,000.

(2) An individual bid item will be considerably significantly unbalanced if the difference between the Low Bidder's unit price and the estimate, expressed as a percent of the estimate, is greater than +50% or is less than -50% for major items.

This project had a total of 121 Items. Of these, 21 items were found to be significantly unbalanced (lower/higher) and placed into a Bid Analysis Table (Attachment A). The criteria for inclusion was as follows:

- All TOKEN bids (penny or dollar).
- All MAJOR items.
- At reviewer's discretion, MINOR items (not significant to Contract) that are 100% above or 75% below the Engineer's Estimate, deemed as viable explanations for bid inconsistencies.

Unbalanced Items Priced Lower Than Engineer's Estimate:

The attached table "A" shows that the Low Bidder was significantly under the Engineer's Estimate for items 42, 45, 99, 149, 150, 152, 166, 172, 192, & 198. See table for item descriptions. Significantly unbalanced items are included in the narrative below:

- The Low Bidder submitted a **"TOKEN"** bid for items 45, 149 & 152. Token Bids are bids with large variations from the Engineer's Estimate such as "penny" or "dollar". The Contractor bid extremely low for these items because they are typically absorbed in some other task and/or the Contractor may have stockpiles of excess materials from previous

projects. These items were principally related to excavation unclassified and temporary sheeting.

- The primary contributor of price discrepancy was Item 149, "EXCAVATION, UNCLASSIFIED". The Low Bidder came in with a price of $1/CY and the Second Lowest Bidder had a price of $30.43/CY. The Engineer's Estimate had a price of $75/CY and was derived by using available average bid history. This item was correctly estimated by the Designer. The Low Bidder's price was much lower than the Engineer's Estimate and other Bidder.
- For item 192, "RETAINING WALL, CAST-IN-PLACE, LOCATION NO. 1", the Low Bidder came in with a price of $200/SF and the Second Lowest Bidder had a price of $275/SF. The Engineer's Estimate had a price of $350/SF and was derived by using available average bid history. This item was correctly estimated by the Designer as consideration was given to the small quantity of 1440 square feet. It appears that the Contractor bid low for this item because they have available resources and a reduced outlay of costs by combining it with another task. The Low Bidder's price was lower than the Engineer's Estimate but in-line when compared to the Second Low Bidder.
- The Low Bidder bid low for Items 166. This is a Lump Sum item. The Engineer's Estimate was priced using sound engineering judgment and average bid history from similar bridge projects. In addition, the RS Means Building Construction Cost Data Book was used for labor and equipment costs. This item was correctly estimated by the Designer. The Contractor bid extremely low for these items because they are typically absorbed in some other task and/or the Contractor may have stockpiles of excess materials from other projects. The cost of these items will not increase and is fixed in price.
- Some of the unit prices were slightly overestimated and the Low Bidder and Second Low Bidder are more in-line with unit prices respectively. The Low Bidder's price is realistic and better reflects current competitive market conditions.

Unbalanced Items Priced Higher Than Engineer's Estimate:

The attached table "A" shows that the Low Bidder was significantly higher the Engineer's Estimate for items 10, 24, 37, 46, 61, 98, 102, 148, 154, 163, 180, 200, 203, & 208. See table for item descriptions. The most significant higher-bid items are further discussed below:

- The Designer verified that the plan quantities of all these items are correct and will not result in any substantial overruns except for Item #37, "CONSTRUCTION BARRIER CURB MOVABLE SYSTEM". **This item will be discussed separately in the analysis**.
- For item 10, "CONSTRUCTION LAYOUT" the Low Bidder came in with a price of $825,000.00/DOLLAR. The Second Low Bidder had a price of $892,500.00/DOLLAR. The Engineer's Estimate had a price of $450,000.00/DOLLAR. Even though the items are bid in "DOLLAR" they are to be viewed as "lump sum" items. NJDOT enacted this revision to the unit to make it easier for the field staff to close out projects and process contractor payments. The Engineer's Estimate was priced using the Lump Sum Chart guidelines found in the Construction Cost Estimation Manual. This item was correctly estimated by the Designer. As

per Section 157 of the NJDOT 2007 Standard Specifications, the payment of this item will be adjusted by the Department based on the final Contract amount.

- Another contributor of price discrepancy was Item 148 "TEMPORARY SHIELDING". The Low Bidder came in with a lump sum price of $1,000,000.00. The Second Low Bidder had a price of $186,454.62. The Engineer's Estimate had a price of $516,000.00 and was derived by using average bid history from similar bridge projects. In addition, the RS Means Building Construction Cost Data Book was used for labor and equipment costs. The Contractor bid high for these items and was higher than the other bidder. This item was reasonably estimated by the Designer. The cost of this item will not increase and is fixed in price.
- Items numbered 61, 154, 208 on Attachment "A" are all for "MICROPILE" at three different locations. The Engineer's Estimate had unit prices that ranged from $4,500.00/U to $9,900/U for each of those items. The Low Bidder had prices of $25,000/U for each of the three locations. The second lowest bidder submitted unit prices that fell within a range of $15,600.00/U to $18,600.00/U. The Low Bidder's price was higher than the other Bidder. The Engineer's Estimate was prepared using limited historical bid price data for micropile items. In general, micropile bid prices are very subjective and project specific and therefore, difficult to estimate. The price difference between the Engineer's Estimate and the Low Bid for the 3 locations was $2,133,600.00. Roughly calculated, it made up 40% of the actual bid cost difference of $5,270,875.60 (derived from difference between the Engineer's Estimate and Low Bid).
- Items numbered 163, 180 on Attachment "A" are for "PREFABRICATED SUPERSTRUCTURE UNITS, HPC" at two different locations. The Engineer's Estimate had unit prices that ranged from $225/SF to $230/SF for each of those items. The Low Bidder had prices of $370/SF for each of the locations. The second lowest bidder submitted unit prices that fell within a range of $423.40/SF to $485/SF. The Engineer's Estimate was derived by using available average bid history. This item was estimated too conservatively by the Designer. The Low Bidder's price was higher than the Engineer's Estimate but lower than the second bidder.
- Some of the unit prices were underestimated and the Low Bidder and Second Low Bidder are more in-line with unit prices respectively. The Low Bidder's price is realistic and better reflects current competitive market conditions.

Item #37 CONSTRUCTION BARRIER CURB, MOVABLE SYSTEM discussed below:

QUANTITY DISCREPANCY FOR ITEM #37:

- As part of our bid analysis our office contacted the NJDOT Project Manager on May 1st with the following request: *"Please contact the Designer and have them re-check the quantity calculations for items #24, 37, 46, 61, 102, 154, 163, 180, 200, 203, & 208. Kindly have them confirm any quantity increases/decreases that they might discover."*

  The Designer's response on May 2nd was as follows: *"Unfortunately, we discovered an error in the quantity for Item No. 37 Construction Barrier Curb, Movable System. The quantity*

shown in the plans and in the EE is 550 LF. This quantity should have been 2,000 LF. All the other items noted below were checked and no discrepancies were found."

Being that the quantity discrepancy was significant, an examination of the bids was undertaken to determine if unbalancing would have any impact on the bidder ranking. **The findings did not show any change in the bidder rankings but did reveal a substantial increase to the total project cost.**

- For item 37, "CONSTRUCTION BARRIER CURB, MOVABLE SYSTEM", the Low Bidder came in with a price of $1,500/LF and the Second Lowest Bidder had a price of $600/LF. The Engineer's Estimate had a price of $1,000/LF and was derived by using limited average bid history and product information supplied by a distributor. The average was $980/LF on past NJDOT projects. This item was correctly estimated by the Designer as consideration was given to the small quantity of 550 square feet. The Low Bidder's price was higher than the Engineer's Estimate and Second Low Bidder.
- Item #37 had a quantity of 550 LF in the Final CES Estimate and Distribution of Quantity plan sheets. The quantity should have been 2,000 LF which now adds an additional 1,450 LF to the project.
- As per Section 104.03.03 of the NJDOT 2007 Standard Specifications, for major increases in quantity, the Department may request to renegotiate the price for the quantity in excess of 125 percent of the Proposal quantity. If a mutual agreement cannot be reached on a renegotiated price, the Department will make payment by force account as specified in 104.03.08. This specification protects the Department from significant changes in contract quantities when major overruns occur. This provision limits the impact on overall costs when unbalanced bid prices are submitted.

Category Comparison:

The table below compares the Engineer's Estimate to the two (2) lowest bidders by way of category subtotals. In general, the Low Bidder bid lower/higher on Items found within the roadway and structure categories. These areas were focused on in the analysis.

	ENGINEER'S ESTIMATE	ANSELMI/DECICCO LOW BIDDER	TARHEEL 2ND LOW BIDDER
0001 ROADWAY	$7,718,653.50	$9,700,574.50	$11,568,255.53
0002 CONSTRUCTION ENG.	$210,000.00	$140,000.00	$198,823.64
0003 ROADWAY NON- PARTICIPATING	$57,300.00	$63,000.00	$95,868.85
0004 EROSION CONTROL	$48,882.75	$66,778.00	$182,535.26
0005 GENERAL LANDSCAPE	$52,877.25	$54,134.10	41,249.90
0006 LATIN LANDSCAPE	$92,335.00	$63,875.00	$78,336.00
0007 BRIDGE 1	$11,096,780.00	$14,191,512.50	$15,293,092.83
0008 BRIDGE 2	$1,279,820.00	$1,625,830.00	$2,151,871.18
0009 RETAINING WALL 1	$586,650.00	$343,100.00	$526,586.20
0010 RETAINING WALL 2	$933,300.00	$767,500.00	$1,011,800.36
0011 RETAINING WALL 3	$185,850.00	$163,220.00	$275,699.34
0012 RETAINING WALL 4	$392,800.00	$759,400.00	$523,818.08
0013 SIGN STRUCTURE 1202-210	$243,500.00	$340,700.00	$350,644.00
0014 SIGN STRUCTURE 1213-218	$100,000.00	$55,000.00	$100,000.00
0015 SIGN STRUCTURE 1213-219	$175,000.00	$110,000.00	$175,000.00
TOTAL	**$23,173,748.50**	**$28,444,624.10**	**$32,573,581.17**

Conclusion:

The Route 18 Bridge over Route 1 must be executed under difficult physical, logistical and scheduling constraints not normally associated with traditional projects. The target completion time for this project is approximately twenty (20) months (achieving Substantial Completion). To achieve this goal while minimizing construction disruption to the traveling public, the project has been divided into nine stages. The schedule assumes that the Contractor will provide multiple crews per work zone operating simultaneously in order to minimize durations of the various tasks associated with the widening operations. It is anticipated each crew provided will be operating during standard eight (8) hour work days, Monday through Friday, except for activities associated with superstructure

demolition and prefabricated superstructure unit (PSU) installation, precast approach slab installation and utility relocations. Superstructure replacement operations will occur during weekends, approach slab installations will occur during off-peak evening hours, and utility relocations will be performed continuously beyond a standard work week as necessary to minimize the overall duration of the relocation work and associated outages. In order to minimize the duration of bridge widening operations and overall impact to the traveling public, prefabricated superstructure units and precast concrete approach slabs have been incorporated into this project.

Although these constraints were clearly identified and included in the Contract documents, their impact on the unit pricing of the various items within the Contract was not fully recognized to the extent that the bidders apparently adjusted their costs to account for the noted conditions. The Engineer's Estimate was slightly underestimated and the Low Bidder and Second Low Bidder are consistently in-line with unit prices respectively. The Low Bidder's price is realistic and better reflects current competitive market conditions.

Recognizing the proximity of the project location to Rutgers University, the construction staging, and specifically the superstructure replacement operations, have been targeted to begin once the spring semester ends and before the succeeding fall semester begins. This approach will take advantage of traditionally lighter summer traffic volumes and have the least impact on the university. Also, the utility relocation and deforestation/clearing work must operate on restricted schedules. Because of the winter shutdown schedule for most concrete and asphalt related activities, the critical activities include construction of widened substructure elements and cast-in-place retaining walls and placement of asphalt courses. Additionally, the bridge superstructure replacement operations will occur during ten (10) summer weekends, such that both bridge structures will be completed prior to the start of the 2015 Rutgers University fall semester.

This project is essential in providing needed upgrades and safety improvements to a critical corridor in the center of our state. In order to make the roadway safe and minimize disruption to a highly congested area, an aggressive completion schedule was set forth in the Contract. Further, any significant delays would have a substantial impact on the completion dates and weather-dependent schedules.

Competition between bidders was determined to be adequate based on FHWA publication "Federal Guidelines on Preparing Engineer's Estimate, Bid Reviews and Evaluation" (January 20, 2004) criteria. As a result, the NJDOT evaluated bids to determine whether additional competition or better prices could be obtained. As well as reviewing bids, the NJDOT assessed constructability issues, scheduling, document quality, design omissions, and risk transference. The Low Bidder bid appears to be reasonable when compared against the Engineer's Estimate. After judicious consideration of the aforementioned factors we feel the project should be awarded. The Non-Participating Items based on the non-certified low bid for this project is requested in the amount of $63,000.00.

The Non-Contract Construction Engineering/Inspection cost (from the Estimate Summary Sheet) for this project is $5,053,093.91.

Attachment(s): Bid Analysis Item Table A, Award Memo

cc: D. Lambert, M. Rollo, S. Patel, D. Hecht, A. Balluch, E. Powers, P. Adams

Sample – Bid Analysis #2

NEW JERSEY DEPARTMENT OF TRANSPORTATION
MEMORANDUM

TO: Anthony Genovese
Manager, Construction Services

FROM: John Varrelmann
Bureau of Construction Management

DATE: October 16, 2014

PHONE: 530-2377

SUBJECT: **BID ANALYSIS**
ROUTE 7, BRIDGE OVER CONRAIL
CONTRACT NO. 002103400
Reconstruction & Structures
Town of Kearny
County of Hudson
Federal Project No. NHP-7675(123)
DP No. 14140

Any Estimate should be considered confidential and should only be made available to Department personnel on a need to know basis.

On October 9, 2014, five (5) bids were received on the above captioned project. The bids were as follows:

No. BIDDERS		BID PRICE	COST DIFFERENCE	PERCENT DIFFERENCE
State	Engineer's Estimate	**$13,810,737.90**		
1	KONKUS CORPORATION	**$13,632,741.91**	**-$177,995.99**	**-1.29%**
2	POWER CONCRETE CO. INC.	**$13,869,924.66**	**$59,186.76**	**0.43%**
3	D'ANNUNZIO & SONS INC.	**$18,327,000.00**	**$4,516,262.10**	**32.70%**
4	J.F CREAMER & SON	**$18,426,404.50**	**$4,615,666.60**	**33.42%**
5	NORTHEAST REMSCO CONSTRUCTION	**$18,547,126.80**	**$4,736,388.90**	**34.29%**

In the opinion of this office, the Low Bid of $13,632,741.91, which was 1.29% under the Engineer's Estimate (Engineer's Estimate = $13,810,737.90 vs. Low Bid = $13,632,741.91) is acceptable. It is recommended that the project be awarded.

Written Analysis:

The difference between the Engineer's Estimate and Low Bid was -$177,995.99.

The Engineer's Estimate was developed using the average weighted prices and bid history for a project of this type and size in this region of New Jersey. The Engineer's Estimate utilized the guidelines provided in the AASHTOWare software documentation for cost justifications. Specially, the Lump Sum Tables found in the NJDOT Construction Cost Estimating Guidelines for items such as Performance and Payment Bond, Final Cleanup, Construction Layout, Progress Schedule, and Clearing Site.

The "NJDOT 2015 Cost Estimating" guidance necessitates that any "MAJOR" unit price items submitted by the apparent Low Bidder be checked for overruns and possible quantity errors. Quantity verification, triggered by apparent unit price unbalancing, involves contacting the project Designer to review quantities and provide written verification. The Designer has verified the quantities in question.

"MAJOR" items are defined as having met <u>two</u> conditions:

(1) An individual bid item will be considered "significant/major" to the Contract if the total extended cost of the bid item makes up a percentage (%) greater than:

- 4% for Contracts below $5,000,000.
- 3% for Contracts that range from $5,000,001 to $20,000,000.
- 2.5% for Contracts that range from $20,000,001 to $50,000,000.
- 2% for Contracts above $50,000,000.

(2) An individual bid item will be considerably significantly unbalanced if the difference between the Low Bidder's unit price and the estimate, expressed as a percent of the estimate, is greater than +50% or is less than -50% for major items.

This project had a total of 121 Items. Of these, 21 items were found to be significantly unbalanced (lower/higher) and placed into a Bid Analysis Table (Attachment A). The criteria for inclusion was as follows:

- All TOKEN bids (penny or dollar).
- All MAJOR items.
- At reviewer's discretion, MINOR items (not significant to Contract) that are 100% above or 75% below the Engineer's Estimate, deemed as viable explanations for bid inconsistencies.

Unbalanced Items Priced Lower Than Engineer's Estimate:

The attached table "A" shows that the Low Bidder was significantly under the Engineer's Estimate for Items 3, 7, 8, 11, 13, 15, 16, 17, 18, 22, 28, 35, 36, 37, 38, 44, 45, 74, 97, 103, 104, 105, 107, 110, 115, 116, & 117. See table for item descriptions. The most significant lower-bid items are further discussed below:

- The primary contributor of price discrepancy was Item 117, "CONCRETE BRIDGE DECK, LIGHTWEIGHT CONCRETE WITH CORROSION INHIBITOR". The Low Bidder came in with a price of $858/CY and the Second Lowest Bidder had a price of $900/CY. The Engineer's Estimate had a price of $1100/CY and was derived by using sound engineering

judgment instead of bid history. The bid library did not have a price for this item and the specification was unique for this project. This item was reasonably estimated by the Designer. It appears that the Contractor bid low for this item because they have available resources and a reduced outlay of costs by combining it with another task. The Low Bidder's price was lower than the Engineer's Estimate but in-line when compared to the Second Low Bidder.

- Another contributor of price discrepancy was Item 8, "MOBILIZATION". The Low Bidder came in with a lump sum price of $1,183,156.00. The Second Low Bidder had a price of $1,000,000.00. The Engineer's Estimate had a price of $1,300,000.00 and was priced using Lump Sum Chart guidelines found in the Construction Cost Estimation Manual. On projects of this type and size, 9-14% of the total project cost is usually used to calculate mobilization. The Engineer's Estimate used 9.4% as a multiplier, whereas, the Low Bidder, calculated at a lower rate. This item was correctly estimated by the Designer. Being Lump Sum, the cost of this item will not increase and is fixed in price.
- For Item 11, "CONSTRUCTION LAYOUT", the Low Bidder came in with a price of $50,000.00/DOLLAR. The Second Low Bidder had a price of $40,000.00/DOLLAR. The Engineer's Estimate had a price of $200,000.00/DOLLAR. Even though the items are bid in "DOLLAR" they are to be viewed as "lump sum" items. NJDOT enacted this revision to the unit to make it easier for the field staff to close out projects and process contactor payments. The Engineer's Estimate was priced using the Lump Sum Chart guidelines found in the Construction Cost Estimation Manual. This item was correctly estimated by the Designer. As per Section 157 of the NJDOT 2007 Standard Specifications, the payment of this item will be adjusted by the Department based on the final Contract amount.
- The Low Bidder submitted a **"TOKEN"** bid for Items 7, 13, 15, 16, 17, 18, 22, 35, 36, 37, 38, 44, 45, 74, 97, & 103. Token Bids are bids with large variations from the Engineer's Estimate such as "penny" or "dollar". The Contractor bid extremely low for these items because they are typically absorbed in some other task and/or the Contractor may have stockpiles of excess materials from other projects. In addition, the bidder may personally own or lease equipment associated with these tasks which would drive the cost down significantly. The Low Bidder's price was lower than the Engineer's Estimate and generally lower when compared to the Second Low Bidder. These items were related to trainees, caution fence, traffic control, erosion control, emergency towing, stripping, test pits, removal of beam guide rail, selective thinning and mowing.
- The Low Bidder bid lower for Items 3, 8, 11, 104, 105, & 110. These are all Lump Sum/Dollar items. The Engineer's Estimate was priced using sound engineering judgment, lump sum charts, and average bid history. These items were correctly estimated by the Designer. The Contractor bid extremely low for these items because they are typically absorbed in some other task and/or the Contractor may have stockpiles of excess materials from other projects. In addition, the bidder may personally own or lease equipment associated with these tasks which would drive the cost down significantly. The cost of these items will not increase and is fixed in price.
- Items numbered 28, 35, 107 &110 are all asphalt/steel related items and were bid lower by the Low Bidder. Prices for these products have fluctuated dramatically over the last year and

can change on a daily basis. During the time period between proposal creation and bidding, market conditions can cause prices to trend higher or lower, causing a wider discrepancy between the Engineer's Estimate and Low Bid. World economic conditions can impact supplies of oil, diesel and liquid asphalt and, as a result, create a shift in market prices.

- Some of the unit prices were slightly overestimated and the Low Bidder and Second Low Bidder are more in-line with unit prices respectively. The Low Bidder's price is realistic and better reflects current competitive market conditions.

Unbalanced Items Priced Higher Than Engineer's Estimate:

The attached table "A" shows that the Low Bidder was significantly higher the Engineer's Estimate for Items 48, 57, 59, 64, 72, 106, 108, 111, 112, 114, & 122. See table for item descriptions. The most significant higher-bid items are further discussed below:

- The Designer verified that the plan quantities of all these items are correct and will not result in any substantial overruns.
- The primary contributor of price discrepancy was Item 106, "TEMPORARY SHIELDING". The Low Bidder came in with a lump sum price of $925,000.00. The Second Low Bidder had a price of $370,000.00. The Engineer's Estimate had a price of $100,000.00 and was derived by using limited bid history from similar bridge projects. In addition, the RS Means Building Construction Cost Data Book was used for labor and equipment costs. The Contractor bid high for these items and was higher than the other bidder. This item was underestimated by the Designer. The cost of this item will not increase and is fixed in price.
- Items numbered 111 & 112 are for "REINFORCED ELASTOMERIC BEARING ASSEMBLY" at two different span locations. The main span and approach spans. The Engineer's Estimate had unit prices that ranged from $500/U to $1300/U for each of those items. The Low Bidder had prices that ranged from $730.54/U to $2,766.58/U for each of the locations. The second lowest bidder submitted unit prices that fell within a range of $2,000/U to $2,400/U. Over the past 12 month period this item has been trending at $500/U-$2,400/U and the estimated prices in the Engineer's Estimate were reasonable. The Low Bidder's price is in-line when compared to other bidders. The Designer verified that the plan quantities are correct and will not result in any substantial overruns.
- Another contributor of price discrepancy was Item 108, "CONCRETE PIER COLUMN AND CAP, LIGHTWEIGHT CONCRETE". The Low Bidder came in with a price of $2,400/CY and the Second Lowest Bidder had a price of $1,600/CY. The Engineer's Estimate had a price of $1,500/CY and was derived by using sound engineering judgment instead of bid history. The bid library did not have a price for this item and the specification was unique for this project. This item was reasonably estimated by the Designer. The Low Bidder's price was higher than the Engineer's Estimate and higher when compared to the Second Low Bidder. The Designer verified that the plan quantity of this item is correct and will not result in any substantial overruns.

- Some of the unit prices were slightly underestimated and the Low Bidder and Second Low Bidder are more in-line with unit prices respectively. The Low Bidder's price is realistic and better reflects current competitive market conditions.
- The NJDOT has a provision in Section 104.03.03 of the NJDOT 2007 Standard Specifications, for major increases in quantity. The Department may request to renegotiate the price for the quantity in excess of 125 percent of the Proposal quantity. If a mutual agreement cannot be reached on a renegotiated price, the Department will make payment by force account as specified in 104.03.08. This specification protects the Department from significant changes in contract quantities when major overruns occur. This provision limits the impact on overall costs when unbalanced bid prices are submitted.

Category Comparison:

The table below compares the Engineer's Estimate to the two (2) lowest bidders by way of category subtotals. In general, the Low Bidder bid lower/higher on Items found within the roadway and structure categories. These areas were focused on in the analysis.

	ENGINEER'S ESTIMATE	KONKUS CORP. LOW BIDDER	POWER CONCRETE 2ND LOW BIDDER
0001 ROADWAY	$3,884,124.00	$3,256,630.06	$3,756,438.66
0002 CONSTRUCTION ENG.	$116,000.00	$94,000.00	$148,000.00
0003 ROADWAY NON- PARTICIPATING	$39,524.00	$20,005.57	$12,636.00
0004 EROSION CONTROL	$111,647.40	$28,753.28	$91,931.00
0005 GENERAL LANDSCAPE	$7,742.50	$12,057.00	$6,789.00
0006 STRUCTURE 0910-153	$9,651,700.00	$10,221,296.00	$9,854,130.00
TOTAL	**$13,810,737.90**	**$13,632,741.91**	**$13,869,924.66**

Conclusion:

This project is essential in providing needed bridge upgrades and roadway improvements to a critical corridor in the northern region of our state. In order to make the roadway safe and minimize disruption to a congested area, an aggressive completion schedule was set forth in the Contract. Further, any significant delays would have a substantial impact on the completion dates and weather-dependent schedules.

Competition between bidders was determined to be adequate based on FHWA publication "Federal Guidelines on Preparing Engineer's Estimate, Bid Reviews and Evaluation" (January 20, 2004) criteria. As a result, the NJDOT evaluated bids to determine whether additional competition or better prices could be obtained. As well as reviewing bids, the NJDOT assessed constructability issues, scheduling, document quality, design omissions, and risk transference. The Low Bidder bid appears

to be reasonable when compared against the Engineer's Estimate. After judicious consideration of the aforementioned factors we feel the project should be awarded. The Non-Participating Items based on the non-certified low bid for this project is requested in the amount of $20,005.57.

The Non-Contract Construction Engineering/Inspection cost (from the Estimate Summary Sheet) for this project is $3,734,747.82.

Attachment(s): Bid Analysis Item Table A & B, Award Memo

cc: D. Lambert, A. Shah, S. Patel, D. Hecht, A. Balluch, K. Abbott, P. Adams

Sample – Analysis Table

Attachment A

Item No.	Item Description	Contr. Quan-tity	Engineer's Unit Price	Engineer's Total Price	*Lowest Unit Price*	*Bidder Total Price*	Second Bidder Unit Price	Second Bidder Total Price
	LOW BID ITEMS							
45	EXCAVATION, UNCLASSIFIED	6,369.00	$40.00	$254,760.00	*$1.00*	*$6,369.00*	$88.44	$563,274.36
149	EXCAVATION, UNCLASSIFIED	4,200.00	$75.00	$315,000.00	*$1.00*	*$4,200.00*	$30.43	$127,806.00
152	TEMPORARY SHEETING	6,800.00	$75.00	$510,000.00	*$1.00*	*$6,800.00*	$150.00	$1,020,000.00
99	20" DUCTILE IRON WATER PIPE, CLASS 52	445.00	$425.00	$189,125.00	*$300.00*	*$133,500.00*	$380.79	$169,451.55
198	TEMPORARY SHEETING	840.00	$100.00	$84,000.00	*$10.00*	*$8,400.00*	$150.00	$126,000.00
42	VIBRATION MONITORING	LS	$125,000.00	$125,000.00	*$15,000.00*	*$15,000.00*	$250,000.00	$250,000.00
150	I-9 SOIL AGGREGATE	2,500.00	$110.00	$275,000.00	*$60.00*	*$150,000.00*	$71.63	$179,075.00
166	TEMPORARY BEAM	LS	$183,750.00	$183,750.00	*$50,000.00*	*$50,000.00*	$149,247.19	$149,247.19
172	DIAMOND GRINDING, CONCRETE DECK SURFACE	23,050.00	$10.00	$230,500.00	*$2.25*	*$51,862.50*	$1.57	$36,188.50
192	RETAINING WALL, CAST-IN-PLACE, LOCATION NO. 1	1,440.00	$350.00	$504,000.00	*$200.00*	*$288,000.00*	$275.00	$396,000.00
	HIGH BID ITEMS							
46	REMOVAL OF PAVEMENT	2,290.00	$25.00	$57,250.00	*$50.00*	*$114,500.00*	$51.85	$118,736.50
98	TEMPORARY WATER PIPING	LS	$19,295.00	$19,295.00	*$75,000.00*	*$75,000.00*	$65,000.00	$65,000.00
102	LINE STOP AND TIE-IN	4.00	$19,500.00	$78,000.00	*$40,000.00*	*$160,000.00*	$50,349.15	$201,396.60
10	CONSTRUCTION LAYOUT	DOLL	$450,000.00	$450,000.00	*$825,000.00*	*$825,000.00*	$892,500.00	$892,500.00
24	CONSTRUCTION BARRIER CURB	2,100.00	$50.00	$105,000.00	*$250.00*	*$525,000.00*	$153.63	$322,623.00
37	CONSTRUCTION BARRIER CURB, MOVABLE SYSTEM	550.00	$1,000.00	$550,000.00	*$1,500.00*	*$825,000.00*	$600.00	$330,000.00
61	MICROPILE	27.00	$4,500.00	$121,500.00	*$25,000.00*	*$675,000.00*	$16,800.00	$453,600.00
148	TEMPORARY SHIELDING	LS	$516,000.00	$516,000.00	*$1,000,000.00*	*$1,000,000.00*	$186,454.62	$186,454.62
154	MICROPILE	95.00	$9,900.00	$940,500.00	*$25,000.00*	*$2,375,000.00*	$15,600.00	$1,482,000.00
163	PREFABRICATED SUPERSTRUCTURE UNITS, HPC	17,220.00	$230.00	$3,960,600.00	*$370.00*	*$6,371,400.00*	$423.40	$7,290,948.00
180	PREFABRICATED SUPERSTRUCTURE UNITS, HPC	2,580.00	$225.00	$580,500.00	*$370.00*	*$954,600.00*	$485.00	$1,251,300.00
203	RETAINING WALL, CAST-IN-PLACE, LOCATION NO. 4	660.00	$350.00	$231,000.00	*$1,000.00*	*$660,000.00*	$555.00	$366,300.00
208	MICROPILE	8.00	$6,800.00	$54,400.00	*$25,000.00*	*$200,000.00*	$18,600.00	$148,800.00

Sample - Award Memo

NEW JERSEY DEPARTMENT OF TRANSPORTATION
MEMORANDUM

TO: Anthony Genovese
Manager, Construction Services

FROM: John Varrelmann
Supervising Engineer,
Bureau of Construction Management

DATE: May 8, 2014

PHONE: 530-2377

SUBJECT: **"Certification Acceptance Procedure, Award of Contract"**

Route 18, Bridge over Route 1
Contract No. 040096440 Grading, Paving and Structures
City of New Brunswick Middlesex County
Federal Project No.: NHP-0029(171)
DP Number: 14102

Low Bidder: **ANSELMI & DECICCO INC.**

Bid Amount: **$28,444,624.10**

The Low Bidder's proposal has been checked and found to be mathematically unbalanced and competitive according to F.H.W.A. "Guidelines on Preparing Engineer's Estimate, Bid Reviews and Evaluation" dated January 20, 2004.

This project is a Non-PoDI (Projects of Division Interest) and according to the Stewardship Agreement, signed June 16, 2015, the State accepts responsibility for concurring the award of the Contract. Therefore, we will not need F.H.W.A. concurrence.

cc S. Shah
D. Lambert
M. Rollo
S. Patel
E. Powers
A. Balluch
P. Adams

Attachment 1

Concept Development Cost Estimating Calculation Spreadsheets (unit prices current as of 2006)

Concept Development

Cost Estimating

Calculation Spreadsheets

June 2006

Table of Contents

Calculation Spreadsheet Information

Introduction

The following calculation spreadsheets are used by the project Designer to develop a scoping-level Concept development construction cost estimate. The estimate is used to set the baseline cost for the project against which all future estimates will be compared.

Calculation Sheet Process

1. The Designer determines which of the seven construction classifications most nearly represents the type of work to be performed. For projects that do not fit into any of the seven classifications, the best results are usually obtained by searching out a previously completed project of a similar nature and adjusting its cost to reflect and scope differences and price escalation.

2. The Designer inputs the project specific information into the appropriate calculation spreadsheet package. Input as much information as is available at the time when the estimate is needed. The more information inputted, the accurate the estimate will be.

3. The Designer has an independent Designer colleague review the calculation spreadsheet package for accuracy and completeness.

4. Once completed and reviewed, the Designer submits the CD calculation spreadsheet package to the Project Manager for review and comment

5. Once the calculation spreadsheet package is found to be acceptable, the Project Manager enters the estimate numbers into the Project reporting System (PRS).

Construction Classifications

The seven Construction Classifications (Work Types) are:

1. <u>NEW CONSTRUCTION</u>

   New construction or major reconstruction of divided or undivided highways. Includes all major phases of construction site preparation, earthwork, drainage, structures, paving, etc. whether contracted separately or as a complete project. Minor items such as signing, landscaping and guardrail are included unless they are in separate specialty contracts. If Maintenance of Traffic will include 2 or more stages or if extensive Maintenance of Traffic equipment is needed, use Class 2.

2. <u>RECONSTRUCTION, WIDENING AND DUALIZATION</u>

   The removal and replacement, rebuilding or upgrading of an existing facility, including intersections. There may be grade changes but normally the changes will not be significant. Includes all phases of construction. May include short relocations. Includes widening equivalent to one lane width or wider. Includes structures when decks are replaced on existing

substructures or decks are widened and substructures extended. Includes intersection improvements when roadway area is also rebuilt.

3. WIDENING AND RESURFACING

Widening and resurfacing of existing highway facilities when the total added width is equivalent to less than one lane width in each direction and grades are not changed. Includes minor grading, extending culverts, curb and gutter, etc. Includes bridge deck widening possibly without substructure changes.

4. RESURFACING

Overlaying existing highways, and surfacing or overlaying existing shoulders with asphaltic material. Includes joint repair, minor widening with asphaltic materials, some base corrections or asphaltic base, curb and gutter replacement, and adjustments at structures, drives and street returns. Does not include extensive reconstruction, pavement replacement or construction of new pavements, excavation, utility or sewer work.

5. BRIDGE REPAIR

Repair of bridges, includes repairs to decks, curbs, rails, beams and structures. If total deck removal and replacement is required, the contract should be classified as reconstruction.

6. INTERSECTION IMPROVEMENTS

Minor construction or reconstruction of street or highway intersections. Normally includes some removal, grading, drainage and paving. May include curb and sidewalk along with traffic signals installed at the intersection. If intersection pavement is to be rebuilt, the contract should be classified as reconstruction.

7. SAFETY AND TRAFFIC CONTROL

Placement or replacement of guide rail, signs, striping, lighting, traffic signals, and other safety and traffic control devices, along streets and highways, when let on a specialty contract basis. If safety and traffic control devices are included as part of a major contract type, they should be included under the Miscellaneous activities for that type.

Note:

- For some types of work, only a range of unit prices could be determined. The Estimator must determine which unit price is most appropriate.
- When there is proposed work to existing structures are within the limits of the proposed project, the Bureau of Structural Engineering shall be contacted to determine the estimated cost of that work.
- The Summary Sheet includes provisions for adding other work types. Examples of possible additions are wetland mitigation, garbage dump removal, toxic waste removal, etc.
- For work which must be constructed at night or done on overtime, increase the Estimate for that work by 30%.
- This procedure does not include engineering design costs.
- The percentages shown for the Utilities (Relocation Companies/Owners) costs are "averages" for each classification of project. Unusual conditions such as power stations, sewerage plants, high-tension lines and pumping stations must be taken into account. If any unusual condition is

encountered, the Designer must contact the Bureau of Utility and Railroad Engineering for guidance in determining the preliminary utility cost. The Utility SME must also be contacted when there is "railroad" involvement. All utility costs must be updated whenever the estimates are updated. If detailed cost estimates are available they should be used instead of the percentages.

- When there is R.O.W. involvement, Contact ROW SME of to obtain a ROW cost which should be added to the Summary Sheet. All R.O.W. costs shall be updated whenever the estimates are updated.
- Federal Non-Participating Construction Cost Work Sheets labeled Attachment No. 2 (located at the end of the section), listing anticipated items of work that FHWA will not participate in, shall be completed and included as the last page of each classification even if the non-participating amount is zero. This total shall already be included in the Construction Cost for the project and will only be used for programming purposes.
- Context sensitive Design (CSD) - There is currently no historical data available to estimate this work. A space has been added to include the costs for the CSD. And additional sheets should be attached to the estimate that details the items of work and costs that were used to determine the CSD total amount. CSD work can include any additional landscape plantings above normal requirements, architectural treatments, or structural work, special types of curb or sidewalk, park areas, etc.

Classification Number 1
(Unit prices current as of 2006)

NEW CONSTRUCTION Spreadsheet Calculation Package

EARTHWORK (must be calculated)

Route _____ **Contract#** _____
PM _____ **UPC No.** _____

	Unit	Quantity	x Unit Price	= Amount
Stripping (4”-6” Depth)	Acre		4,050	
Roadway Exc. Unclassified	C.Y.		See (J)	
Removal of Conc. Base & Conc. Surface Courses	S.Y.		11.2-12.5 See (K)	
Channel Excavation	C.Y.		12.25	
Ditch Excavation	C.Y.		10.00	
Borrow Excavation Zone 3	C.Y.		See (J)	
			EARTHWORK TOTAL	=

Suggested procedure for calculating earthwork:

A) Determine Typical Section (number of lanes, median widths, side slopes, etc.).

B) Get latest topography map available.

C) Plot proposed alignment on topo map.

D) Develop profile using topo controls such as existing roads, streams, rivers and design manual.

E) Calculate Areas for the typical section in 1 foot increments of cut or fill.

F) At 100 foot intervals (depending on frequency of X-section changes) calculate the earthwork.

G) Calculate any other significant earthwork (ramps, crossroads, etc.).

H) Make appropriate earthwork corrections for the pavement box and striping. Use 21 inch depth for rigid pavement, 26 inch depth for all flexible pavement and 4 inch depth for stripping.

I) Deduct any roadway excavation from borrow required to calculate Borrow Excavation Zone 3.

J) See Construction Cost Estimate Work Sheet (Attachment 1). This worksheet must be utilized for the most recent price information.

K) Based on the quantity, location and type of project.

PAVEMENT

12 FOOT WIDE LANE (from subgrade up)

Pavement Type	Description of Pavement	Cost/Linear Foot
A	10 inch R.C. Pavement	= 156
B	2 inch HMA Surf. Course & 8 inch HMA Base Course	= 61
C	3 inch HMA Surf. Course & 4 inch HMA Base Course	= 46
D	2 inch HMA Surf. Course & 2 inch HMA Base Course	= 22
E	Bridge Approach & Transition Slabs	= 156

Computation Table for Pavement. Cost

Type	Cost	X Length	X Pavement *W.F.	= Amount
			PAVEMENT TOTAL	=

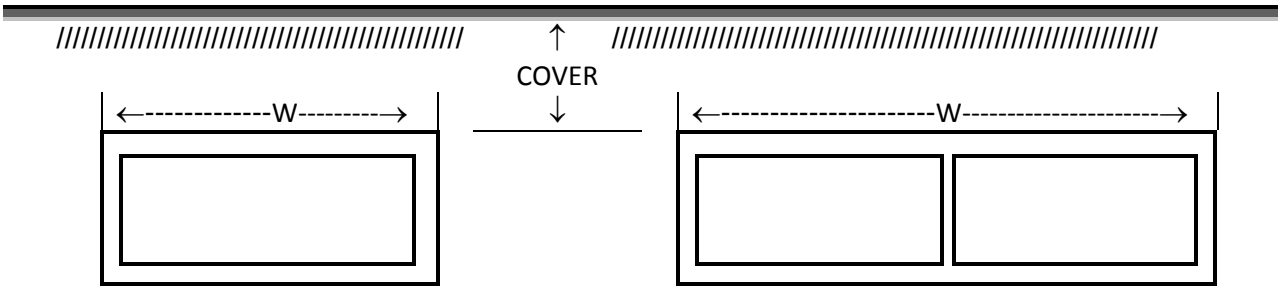
*Width Factors = Ratio of 12 foot wide lane to actual pavement width.

Example = actual pavement width = 25 foot = 25/12 = 2.08 W.F.

Context Sensitive Design

Context Sensitive Design – Attach additional sheet detailing items and costs of context sensitive design work	

CULVERTS



Type 1 W ≤ 20 feet

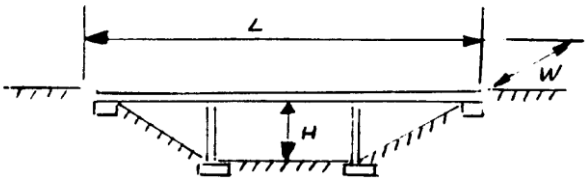
Type 2 W > 20 feet

Type	Layout (3)	Skew (1)	Cover (2)	Cost Per Sq. Foot
Type 1	Area W x L exceeds 1000 Sq. Feet	0-60 degrees	0 to 10’	114.75
			10’ to 20’	147.25
	Short Culverts Difficult Conditions under Square Meters	0-60 degrees	0 to 10’	203.50
			10’ to 20’	235.00
Type 2	Area W x L exceeds 1000 Sq. Feet	0-60 degrees	0 to 10’	121.75
			10’ to 20’	152.50
	Short Culverts Difficult Conditions under 1000 Square Feet	0-60 degrees	0 to 10’	203.50
			10’ to 20’	235.00

For skews over 60 degrees it will be necessary to make a special analysis and establish a square foot price comparable to above.

Description	Area Computation	x Cost per Sq. Foot	= Amount
		CULVERT TOTAL	=

BRIDGES - (1 of 3)

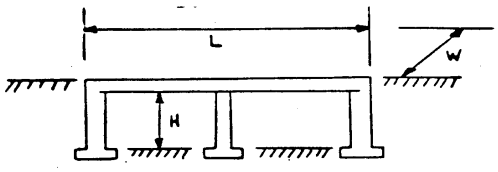


1 to 3 spans and 2 side spans (Max. Span 100 feet)

H - Clear Height 14 to 23 feet[4]

L - 100 to 400 feet & all Viaducts Over 400 feet [5]

Class	Layout	Skew [1]	Foundation [2]	Cost Per Sq. Foot
I	Width at Least 45 Feet	0 Degrees-40 Degrees	No Piles	134.75
			Piles at Stub Abut.	159.75
			Piles at Piers & Stub Abut.	174.75
		40 Degrees-60 Degrees	No Piles	145.00
			Piles at Stub Abut.	168.25
			Piles at Piers & Stub Abut.	181.25

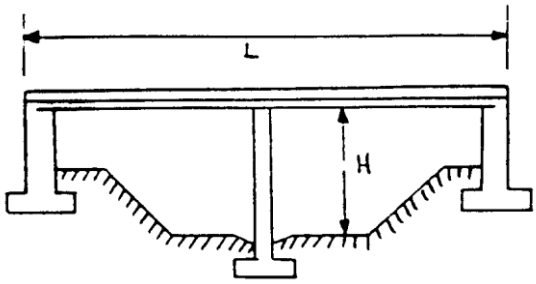


1 to 3 Main Spans (Max. Span 100 Feet [3]

H - Clear Height 14 feet [4]

L - Length Under 400 feet

Class	Layout	Skew [1]	Foundation [2]	Cost Per Sq. Foot
II	L exceeds W Area L x W exceeds 4500 Sq. Feet	0 Degrees-40 Degrees	No Piles	176.50
			On Piles	187.25
		40 Degrees-60 Degrees	No Piles	219.75
			On Piles	273.25
III	W exceeds L Area L x W exceeds 4500 Sq. Feet	0 Degrees-40 Degrees	No Piles	226.75
			On Piles	299.25
		40 Degrees-60 Degrees	No Piles	241.50
			On Piles	310.00
IV	Width 30 - 45 feet Area W x L under 4500 Sq. Foot	0 Degrees-40 Degrees	No Piles	295.50
			On Piles	396.75
		40 Degrees-60 Degrees	No Piles	318.25
			On Piles	416.25



BRIDGES - (2 of 3)

1 to 2 Main Spans (Max. Span 125 feet)

H - Clear Height 14 feet

L - 100 – 250 feet

Layout	Skew (1)	Foundation (2)	Cost Per Sq. Foot
Width at Least 40 feet Minimum Length 100 feet	0 Degrees to 40 Degrees	No Piles	157.00
		Piles at Semi-Stub Abut.	182.00
		Piles at Piers & Semi Stub Abut.	204.50
	40 Degrees to 60 Degrees	No Piles	166.50
		Piles at Semi-Stub Abut.	194.75
		Piles at Piers & Semi Stub Abut.	217.50

	x	x	=
Length	Width	Cost per SF	Bridge Total

BRIDGES - (3 of 3)

1. For skews over 60 degrees it will be necessary to make a special analysis and establish a square meter price comparable to above.

2. For very bad foundation conditions requiring unusual lengths or spacing of piles, it will be necessary to establish a square foot price.

3. For longer spans, adjust the cost per square foot to reflect increased cost of structural members.

4. For span bridges, it is expected the length of the side span will be in- creased in proportion to any increase in height. Because of the resultant increase in deck area, the square foot price will remain approximately the same in the range of heights shown. For extremely high structures (particularly for viaducts), square foot prices will have to be increased.

5. For structures over 400 foot long (viaducts), reduce the cost per square foot if repetitive span length and forming can be used. Reduce by $0.50 for lengths from 400 to 600 feet and by $1.00 for lengths over 600 feet. (Do not forget the adjustments (3) and (4) above on viaducts).

6. For statically indeterminate structures, square meter prices will have to be established.

Structure Description	Calculated Sq. Foot of Bridge Deck	x Cost Per Sq. Foot	= Amount
		Sub Total	=
Clearing Site Bridge *0-3% of Sub Total =			+
*Pick appropriate percent based on the size, type and materials of existing structure		**BRIDGE TOTAL**	=

DRAINAGE (includes inlets and cross drains)

	Project Length (miles)	x Cost per Mile	= Amount
Rural		364,356	
Urban		544,280	

The above are the total costs of basins, manholes, longitudinal and transverse pipes, underdrains, headwalls, protecting curbs, aprons, etc. for a divided highway with a depressed median. The costs are assumed to apply to 4, 6 or 8 lane sections since there will be no appreciable difference in the number of basins or the sizes or lengths of pipes.

Frontage Road & Ramp Drainage

Length of Ramp or Frontage Road (feet)	x Cost per Foot	= Amount
	55.00	

DRAINAGE TOTAL	=

INCIDENTAL ITEMS

Item	Quantity	x Unit Price	= Amount
Beam Guide Rail		16.75/L.F.	
Fence 6 Foot High		18.25/L.F.	
9” X 16” Conc. Vertical Curb		13.75/L.F.	
15” X 41” Conc. Barrier Curb		50.25/L.F.	
24” X 41” Conc. Barrier Curb		73.25/L.F.	
24” X Variable Conc. Barrier Curb		46/L.F.	
Sign Bridge		308,000	
Cantilever Sign Structure		60,500	
		INCIDENTAL ITEMS TOTAL	=

LANDSCAPE

	Quantity	x Unit Price	= Amount
Topsoil and Seeding (Mainline) Length of Project in miles		112,815	
Planting (Mainline) Length of Project in miles		64,500	
Topsoil, Seeding, Planting (Finger Ramp Number of Finger Ramps		12,500	
Topsoil, Seeding, Planting (Loop Ramp) Number of Loop Ramps		20,000	
Topsoil, Seeding (Access Road) Length of Access Road in Feet		7.90	
		LANDSCAPE TOTAL	=

NOISE ABATEMENT MEASURES

	Unit	Quantity	x Unit Price	= Amount
Noise Wall	L.F.		305	
			NOISE ABATEMENT MEASURES TOTAL	=

GENERAL ITEMS

Item	Project Length (miles)	x Cost/mile	= Amount
Field Office		44,260	
Materials Field Laboratory		28,970	
Erosion Control during Construction		64,375	
		GENERAL ITEMS TOTAL	=

Classification No. 1 - NEW CONSTRUCTION - SUMMARY Page 1 of 3

Route _____ **Section/Contract#** _____

PM **UPC No.**

Work Type	Totals from previous pages
Earthwork	
Pavement	
Culverts	
Bridges	
Drainage	
Incidental Items	
Landscape	
Noise Abatement	
General Items	
Context Sensitive Design	
PROJECT SUBTOTAL	=

Other Items	Proj. Subtotal Range	Choice	Amount
Lighting, Traffic Stripes, Signs and Delineators		3% of Proj. Subtotal	
Maintenance of Traffic		1.5% of Proj. Subtotal	
Training		1% of Proj. Subtotal	
Mobilization	Project Cost (Mil.)	% of Proj. Subtotal	
	Less than 5.0	9% of Proj. Subtotal	
	5.0 & above	10% of Proj. Subtotal	
Progress Schedule	Project Cost (Mil.)	$	
	Less than 2.0	0	
	2.0 to 5.0	6,000	
	5.0 to 10.0	8,000	
	10.0 to 20.0	15,000	
	20.0 to 30.0	30,000	
	30.0 to 40.0	40,000	
	40.0 & above	58,000	
Clearing Site	Project Cost (Mil.)	$	
	Less than 1.0	15,000	
	1.0 to 2.0	30,000	
	2.0 to 5.0	45,000	
	5.0 to 10.0	115,000	
	10.0 to 20.0	220,000	
	20.0 to 30.0	240,000	
	30.0 to 40.0	250,000	
	40.0 & above	490,000	

* Continued on next page

Classification No. 1 - NEW CONSTRUCTION – SUMMARY Page 2 of 3

Route _____ **Section/Contract#** _____

PM _____ **UPC No.** _____

Construction Layout	Project Cost (Mil.)	$	
	Less than 1.0	7,000	
	1.0 to 2.0	20,000	
	2.0 to 5.0	42,000	
	5.0 to 10.0	87,000	
	10.0 to 20.0	160,000	
	20.0 to 30.0	220,000	
	30.0 to 40.0	490,000	
	40.0 & above	890,000	
		PROJECT TOTAL	=

CONTINGENCIES & ESCALATION

	x	X	=
Project Total	(1+ C)	1 + [0.01 (Y+1) (Y-2)]	**Construction Estimate for CD**
	Contingencies	Y = Number of Years until midpoint of construction duration. If midpoint is less than 2 years no escalation is required. Maximum value = 10%.	

Project Cost (Mil.)	Contingencies (C) Percent	Average Construction Duration in Years
0-10	3%	1
10-20	2.5%	2
20-50	2%	3
Over 50	1.5%	4

CONSTRUCTION ENGINEERING (CE)

Project Cost (Mil.)	% of Construction Cost
Less than 1.0	28.4%
1.0 to 5.0	17.6%
5.0 to 10.0	12.2%
10.0 & above	9.5%
CONSTRUCTION ENGINEERING AMOUNT	

Classification No. 1 - NEW CONSTRUCTION - ENGLISH – SUMMARY Page 3 of 3

Route		**Section/Contract#**	
PM		**UPC No.**	

CONTINGENCIES FOR CONSTRUCTION CHANGE ORDER

Total Federal Participating Items in Millions of $	Construction Change Order Contingency Amount
$0 to 0.1	$6,000
0.1 to 0.5	25,000
0.5 to 5.0	25,000 + 4% of amount in excess of $500,000
5.0 to 10.0	205,000 + 3% of amount in excess of $5,000,000
10.0 to 15.0	355,000 + 2% of amount in excess of $10,000,000
15.0 and Above	500,000

For State Funded Projects, Contingencies for Change orders = 0

CHANGE ORDER CONTINGENCIES =

UTILITIES RELOCATIONS BY COMPANIES/OWNERS

	x 0.09 or	
	+ Estimate	=
Construction Cost for PD Estimate	Use % or utilities detailed estimate	**Utility Relocation Cost for CD Estimate**

If there are no utility relocations on the project indicate “No Utilities” in the box above.

RIGHT OFWAY COST

If there is no ROW cost on the project indicate “No ROW” the box

SUMMARY

Construction Estimate for CD	
Construction Engineering (CE)	
Contingencies	
Utilities: Relocations By Companies	
Total Estimate	
Right of Way	

Classification Number 2
(Unit prices current as of 2006)

RECONSTRUCTION, WIDENING & DUALIZATION Spreadsheet Calculation

Package

EARTHWORK (must be calculated)

Route _____ **Section/Contract#** _____
PM _____ **UPC No.** _____

	Unit	Quantity	x Unit Price	= Amount
Stripping (4”-6” Depth)	Acre		4050	
Roadway Exc. Unclassified	C.Y.		See (J)	
Removal of Conc. Base & Conc. Surface Courses	S.Y.		15.00	
Channel Excavation	C.Y.		12.25	
Ditch Excavation	C.Y.		10.00	
Borrow Excavation Zone 3	C.Y.		See (J)	
			EARTHWORK TOTAL	=

Suggested procedure for calculating earthwork:

A) Determine typical section (number of lanes, median widths, side slopes, etc.).

B) Get latest topography map available.

C) Plot proposed alignment on topo map.

D) Develop profile using topo controls such as existing roads, streams, rivers and design manual.

E) Calculate Areas for the typical section in 1 foot increments of cut or fill.

F) At 10 to 60 foot intervals (depending on frequency of X-section changes) calculate the earthwork.

G) Calculate any other significant earthwork (ramps, crossroads, etc.).

H) Make appropriate earthwork corrections for the pavement box and striping. Use 21 inch depth for rigid pavement, 26 inch depth for all flexible pavement and 4 inch depth for stripping.

I) Deduct any roadway excavation from borrow required to calculate Borrow Excavation Zone 3.

J) See Construction Cost Estimate Work Sheet (Attachment 1). This worksheet must be utilized for the most recent price.

PAVEMENT

12 FOOT WIDE LANE (from subgrade up)

Pavement. Type	Description of Pavement	Cost/Linear Foot
A	10 inch R.C. Pavement	= 156
B	2 inch HMA Surf. Course & 8 inch HMA Base Course	= 61
C	3 inch HMA Surf. Course & 4 inch HMA Base Course	= 46
D	2 inch HMA Surf. Course & 2 inch HMA Base Course	= 22
E	Bridge Approach & Transition Slabs	= 156
	(Resurfacing Portion only F & G)	
F	2 inch HMA Surface Course	= 8.25
G	3 inch HMA Surface Course	= 12
H	Milling 2 inch	= 3

Computation Table for Pavement. Cost

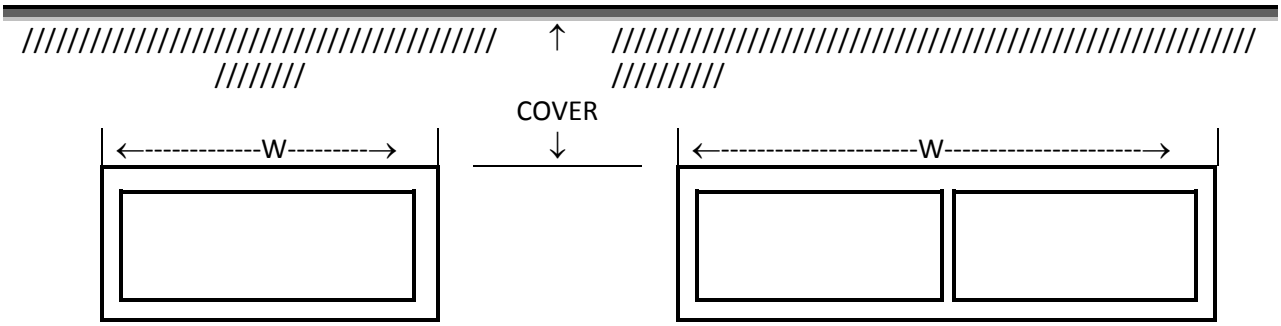
Type	Cost	X Length	X Pavement *W.F.	= Amount
			PAVEMENT TOTAL	=

*Width Factors = Ratio of 12 foot wide lane to actual pavement width.
Example = actual pavement width = 25 feet = 25/12 = 2.08 W.F.

Context Sensitive Design

Context Sensitive Design – Attach additional sheet detailing items and costs of context sensitive design work	

CULVERTS



Type 1 W ≤ 20 Feet

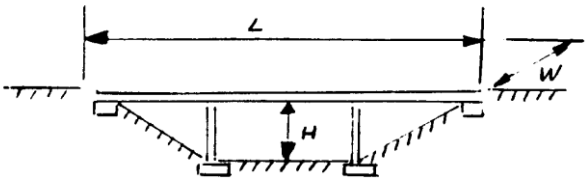
Type 2 W > 20 Feet

Type	Layout (3)	Skew (1)	Cover (2)	Cost Per Sq. Foot
Type 1	Area W x L exceeds 1000 Sq. Feet	0-60 degrees	0 to 10’	114.75
			10’ to 20’	147.25
	Short Culverts Difficult Conditions under Square Meters	0-60 degrees	0 to 10’	203.50
			10’ to 20’	235.00
Type 2	Area W x L exceeds 1000 Sq. Feet	0-60 degrees	0 to 10’	121.75
			10’ to 20’	152.50
	Short Culverts Difficult Conditions under 1000 Square Feet	0-60 degrees	0 to 10’	203.50
			10’ to 20’	235.00

For skews over 60 degrees it will be necessary to make a special analysis and establish a square foot price comparable to above.

Description	Area Computation	x Cost per Sq. Foot	= Amount
		CULVERT TOTAL	=

BRIDGES (1 of 3)

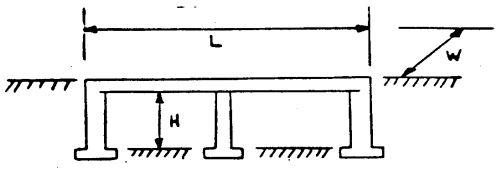


1 to 3 spans and 2 side spans (Max. Span 100 feet)

H - Clear Height 14 to 23 feet[4]

L - 100 to 400 feet & all Viaducts Over 400 feet [5]

Class	Layout	Skew [1]	Foundation [2]	Cost Per Sq. Foot
I	Width at Least 45 Feet	0 Degrees-40 Degrees	No Piles	134.75
			Piles at Stub Abut.	159.75
			Piles at Piers & Stub Abut.	174.75
		40 Degrees-60 Degrees	No Piles	145.00
			Piles at Stub Abut.	168.25
			Piles at Piers & Stub Abut.	181.25



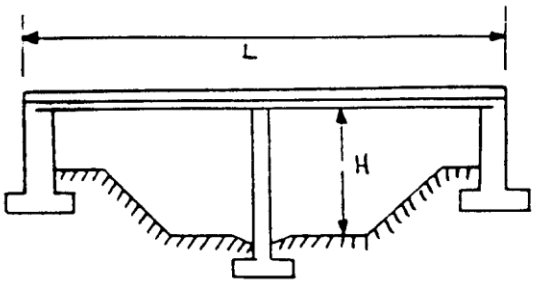
1 to 3 Main Spans (Max. Span 100 Feet [3]

H - Clear Height 14 feet [4]

L - Length Under 400 feet

Class	Layout	Skew [1]	Foundation [2]	Cost Per Sq. Foot
II	L exceeds W Area L x W exceeds 4500 Sq. Feet	0 Degrees-40 Degrees	No Piles	176.50
			On Piles	187.25
		40 Degrees-60 Degrees	No Piles	219.75
			On Piles	273.25
III	W exceeds L Area L x W exceeds 4500 Sq. Feet	0 Degrees-40 Degrees	No Piles	226.75
			On Piles	299.25
		40 Degrees-60 Degrees	No Piles	241.50
			On Piles	310.00
IV	Width 30 - 45 feet Area W x L under 4500 Sq. Foot	0 Degrees-40 Degrees	No Piles	295.50
			On Piles	396.75
		40 Degrees-60 Degrees	No Piles	318.25
			On Piles	416.25

BRIDGES cont'd (2 of 3)



1 to 2 Main Spans (Max. Span 125 feet)

H - Clear Height 14 feet

L - 100 – 250 feet

Layout	Skew (1)	Foundation (2)	Cost Per Sq. Foot
Width at Least 40 feet Minimum Length 100 feet	0 Degrees to 40 Degrees	No Piles	157.00
		Piles at Semi-Stub Abut.	182.00
		Piles at Piers & Semi Stub Abut.	204.50
	40 Degrees to 60 Degrees	No Piles	166.50
		Piles at Semi-Stub Abut.	194.75
		Piles at Piers & Semi Stub Abut.	217.50

	x	x	=
Length	Width	Cost per SF	Bridge Total

BRIDGES cont'd (3 of 3)

1. For skews over 60 degrees it will be necessary to make a special analysis and establish a square foot price comparable to above.

2. For very bad foundation conditions requiring unusual lengths or spacing of piles, it will be necessary to establish a square foot price.

3. For longer spans, adjust the cost per square foot to reflect increased cost of structural members.

4. For span bridges, it is expected the length of the side span will be in- creased in proportion to any increase in height. Because of the resultant increase in deck area, the square foot price will remain approximately the same in the range of heights shown. For extremely high structures (particularly for viaducts), square foot prices will have to be increased.

5. For structures over 400 foot long (viaducts), reduce the cost per square foot if repetitive span length and forming can be used. Reduce by $0.50 for lengths from 400 to 600 feet and by $1.00 for lengths over 600 feet. (Do not forget adjustments (3) and (4) above on viaducts).

6. For statically indeterminate structures, square foot prices will have to be established.

Structure Description	Calculated Sq. Foot of Bridge Deck	x Cost Per Sq. Foot	= Amount

	Sub Total	=
Clearing Site Bridge *0-3% of Sub Total =		+
*Pick appropriate percent based on the size, type and materials of existing structure	**BRIDGE TOTAL**	=

DRAINAGE (includes inlets and cross drains)

	Project Length (miles)	x Cost per Mile	= Amount
Rural		364,356	
Urban		544,280	

The above are the total costs of basins, manholes, longitudinal and transverse pipes, underdrains, headwalls, protecting curbs, aprons, etc. for a divided highway with a depressed median. The costs are assumed to apply to 4, 6 or 8 lane sections since there will be no appreciable difference in the number of basins or the sizes or lengths of pipes.

Frontage Road & Ramp Drainage

Length of Ramp or Frontage Road (feet)	x Cost per Foot	= Amount
	55.00	

DRAINAGE TOTAL	=

LANDSCAPE

	Quantity	x Unit Price	= Amount
Topsoil and Seeding (Mainline) Length of Project in miles		112,815	
Planting (Mainline) Length of Project in miles		64,500	
Topsoil, Seeding, Planting (Finger Ramp Number of Finger Ramps		12,500	
Topsoil, Seeding, Planting (Loop Ramp) Number of Loop Ramps		20,000	
Topsoil, Seeding (Access Road) Length of Access Road in Feet		7.90	
		LANDSCAPE TOTAL	=

INCIDENTAL ITEMS

Item	x Quantity	x Unit Price	= Amount
Beam Guide Rail		16.75/L.F.	
Fence 6 Foot High		18.25/L.F.	
9" X 16" Conc. Vertical Curb		13.75/L.F.	
15" X 41" Conc. Barrier Curb		50.25/L.F.	
24" X 41" Conc. Barrier Curb		73.25/L.F.	
24" X Variable Conc. Barrier Curb		46/L.F.	
Sign Bridge		308,000	
Cantilever Sign Structure		60,500	
		INCIDENTAL ITEMS TOTAL	=

NOISE ABATEMENT MEASURES

	Unit	Quantity	x Unit Price	= Amount
Noise Wall	L.F.		305	
			NOISE ABATEMENT MEASURES TOTAL	=

GENERAL ITEMS

Item	Project Length (miles)	x Cost/mile	= Amount
Field Office		44,260	
Materials Field Laboratory		28,970	
Erosion Control during Construction		64,375	
		GENERAL ITEMS TOTAL	=

Class. No. 2 - RECONSTRUCTION, WIDENING & DUALIZATION – SUMMARY Page 1 of 3

Route _____ **Section/Contract#** _____

PM **UPC No.**

Work Type	Totals from previous pages
Earthwork	
Pavement	
Culverts	
Bridges	
Drainage	
Incidental Items	
Landscape	
Noise Abatement	
General Items	
Context Sensitive Design	
PROJECT SUBTOTAL	=

Other Items	Proj. Subtotal Range	Choice	Amount
Lighting, Traffic Stripes, Signs and Delineators		3% of Proj. Subtotal	
Maintenance of Traffic		7% of Proj. Subtotal	
Training		1% of Proj. Subtotal	
Mobilization	Project Cost (Mil.)	% of Proj. Subtotal	
	Less than 5.0	9% of Proj. Subtotal	
	5.0 & above	10% of Proj. Subtotal	
Progress Schedule	Project Cost (Mil.)	$	
	Less than 2.0	0	
	2.0 to 5.0	6,000	
	5.0 to 10.0	8,000	
	10.0 to 20.0	15,000	
	20.0 to 30.0	30,000	
	30.0 to 40.0	40,000	
	40.0 & above	58,000	
Clearing Site	Project Cost (Mil.)	$	
	Less than 1.0	15,000	
	1.0 to 2.0	30,000	
	2.0 to 5.0	45,000	
	5.0 to 10.0	115,000	
	10.0 to 20.0	220,000	
	20.0 to 30.0	240,000	
	30.0 to 40.0	250,000	
	40.0 & above	490,000	

* Continued on next page

Class. No. 2 - RECONSTRUCTION, WIDENING & DUALIZATION – SUMMARY Page 2 of 3

Route _____ **Section/Contract#** _____

PM _____ **UPC No.** _____

Construction Layout	Project Cost (Mil.)	$	
	Less than 1.0	7,000	
	1.0 to 2.0	20,000	
	2.0 to 5.0	42,000	
	5.0 to 10.0	87,000	
	10.0 to 20.0	160,000	
	20.0 to 30.0	220,000	
	30.0 to 40.0	490,000	
	40.0 & above	890,000	
		PROJECT TOTAL	=

CONTINGENCIES & ESCALATION

	x	X	=
Project Total	(1+ C)	1 + [0.01 (Y+1) (Y-2)]	**Construction Cost for CD Estimate**
	Contingencies	Y = Number of Years until midpoint of construction duration. If midpoint is less than 2 years no escalation is required.	

Project Cost (Mil.)	Contingencies (C) Percent	Average Construction Duration in Years
0-5	3%	1
5-20	2.5%	2
Over 20	2%	3

ROW COST

If there is no ROW cost on the project indicate "No ROW" the box

CONSTRUCTION ENGINEERING (CE)

Project Cost (Mil.)	% of Construction Cost
Less than 1.0	31.1%
1.0 to 5.0	20.3%
5.0 to 10.0	16.2%
10.0 & above	12.2%
CONSTRUCTION ENGINEERING AMOUNT	

Class. No. 2 - RECONSTRUCTION, WIDENING & DUALIZATION – SUMMARY Page 3 of 3

Route		**Section/Contract#**	
PM		**UPC No.**	

CONTINGENCIES FOR CONSTRUCTION CHANGE ORDER

Total Federal Participating Items in Millions of $	Construction Change Order Contingency Amount
$0 to 0.1	$6,000
0.1 to 0.5	25,000
0.5 to 5.0	25,000 + 4% of amount in excess of $500,000
5.0 to 10.0	205,000 + 3% of amount in excess of $5,000,000
10.0 to 15.0	355,000 + 2% of amount in excess of $10,000,000
15.0 and Above	500,000

For State Funded Projects, Contingencies for Change orders = 0

CONTINGENCIES =

UTILITIES RELOCATIONS BY COMPANIES/OWNERS

	*	=
Construction Cost for CD Estimate	*for Urban use 12%, Rural 5.5%	**Utility Relocation Cost for CD Estimate**

or use utilities detailed estimates as soon as available.
If there are no utility relocations on the project indicate “No Utilities” in the box above.

RIGHT OFWAY COST
If there is no ROW cost on the project indicate “No ROW” the box

SUMMARY

Construction Estimate for PD	
Construction Engineering (CE)	
Contingencies	
Utilities: Relocations By Companies	
Total Estimate	
Right of Way	

Classification Number 3
(Unit prices current as of 2006)

WIDENING & RESURFACING Spreadsheet Calculation Package

EARTHWORK (must be calculated)

Route _____ **Section/Contract#** _____
PM _____ **UPC No.** _____

	Unit	Quantity	x Unit Price	= Amount
Stripping (4”-6” Depth)	Acre		4050	
Roadway Exc. Unclassified	C.Y.		See (J)	
Removal of Conc. Base & Conc. Surface Courses	S.Y.		15.00	
Channel Excavation	C.Y.		12.25	
Ditch Excavation	C.Y.		10.00	
Borrow Excavation Zone 3	C.Y.		See (J)	
			EARTHWORK TOTAL	=

Suggested procedure for calculating earthwork:

A) Determine typical section (number of lanes, median widths, side slopes, etc.).

B) Get latest topography map available.

C) Plot proposed alignment on topo map.

D) Develop profile using topo controls such as existing roads, streams, rivers and design manual.

E) Calculate Areas for the typical section in 1 foot increments of cut or fill.

F) At 10 to 60 foot intervals (depending on frequency of X-section changes) calculate the earthwork.

G) Calculate any other significant earthwork (ramps, crossroads, etc.).

H) Make appropriate earthwork corrections for the pavement box and striping. Use 21 inch depth for rigid pavement, 26 inch depth for all flexible pavement and 4 inch depth for stripping.

I) Deduct any roadway excavation from borrow required to calculate Borrow Excavation Zone 3.

J) See Construction Cost Estimate Work Sheet (Attachment 1). This worksheet must be utilized for the most recent price information.

PAVEMENT

12 FOOT WIDE LANE (from subgrade up)

Pavement Type	Description of Pavement	Cost/Linear Foot
A	10 inch R.C. Pavement	= 156
B	2 inch HMA Surf. Course & 8 inch HMA Base Course	= 61
C	3 inch HMA Surf. Course & 4 inch HMA Base Course	= 46
D	2 inch HMA Surf. Course & 2 inch HMA Base Course	= 22
E	Bridge Approach & Transition Slabs	= 156
	(Resurfacing Portion only F & G)	
F	2 inch HMA Surface Course	= 8.25
G	3 inch HMA Surface Course	= 12
H	Milling 2 inch	= 3

Computation Table for Pavement. Cost

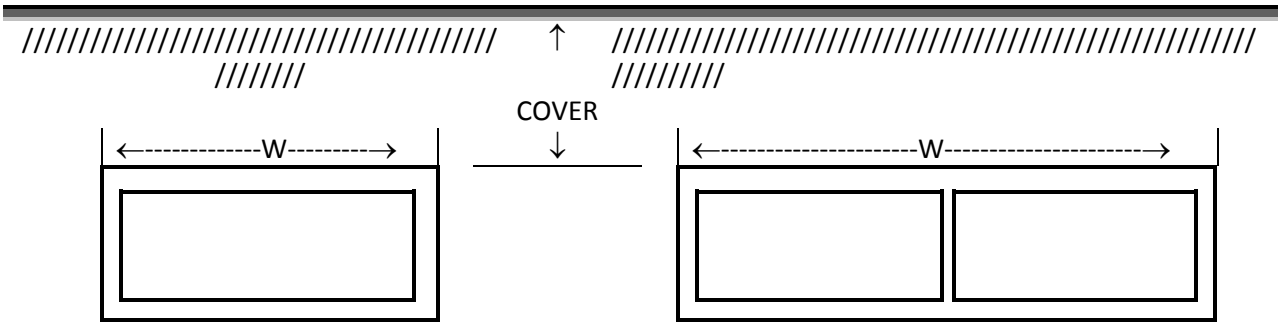
Type	Cost	X Length	X Pavement *W.F.	= Amount
			PAVEMENT TOTAL	=

*Width Factors = Ratio of 12 foot wide lane to actual pavement width.
Example = actual pavement width = 25 foot = 25/12 = 2.08 W.F.

Context Sensitive Design

Context Sensitive Design – Attach additional sheet detailing items and costs of context sensitive design work	

CULVERTS



Type 1 W ≤ 20 feet

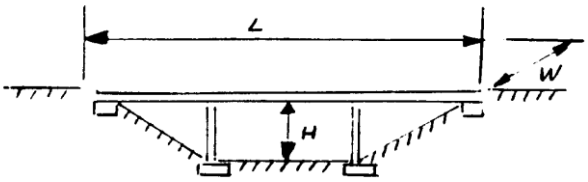
Type 2 W > 20 feet

Type	Layout (3)	Skew (1)	Cover (2)	Cost Per Sq. Foot
Type 1	Area W x L exceeds 1000 Sq. Feet	0-60 degrees	0 to 10’	114.75
			10’ to 20’	147.25
	Short Culverts Difficult Conditions under Square Meters	0-60 degrees	0 to 10’	203.50
			10’ to 20’	235.00
Type 2	Area W x L exceeds 1000 Sq. Feet	0-60 degrees	0 to 10’	121.75
			10’ to 20’	152.50
	Short Culverts Difficult Conditions under 1000 Square Feet	0-60 degrees	0 to 10’	203.50
			10’ to 20’	235.00

For skews over 60 degrees it will be necessary to make a special analysis and establish a square foot price comparable to above.

Description	Area Computation	x Cost per Sq. Foot	= Amount
		CULVERT TOTAL	=

BRIDGES - (1 of 3)

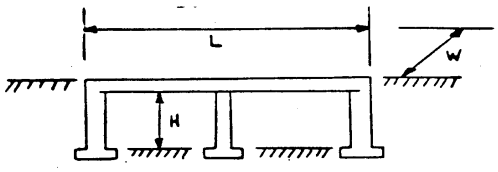


1 to 3 spans and 2 side spans (Max. Span 100 feet)

H - Clear Height 14 to 23 feet[4]

L - 100 to 400 feet & all Viaducts Over 400 feet [5]

Class	Layout	Skew [1]	Foundation [2]	Cost Per Sq. Foot
I	Width at Least 45 Feet	0 Degrees-40 Degrees	No Piles	134.75
			Piles at Stub Abut.	159.75
			Piles at Piers & Stub Abut.	174.75
		40 Degrees-60 Degrees	No Piles	145.00
			Piles at Stub Abut.	168.25
			Piles at Piers & Stub Abut.	181.25

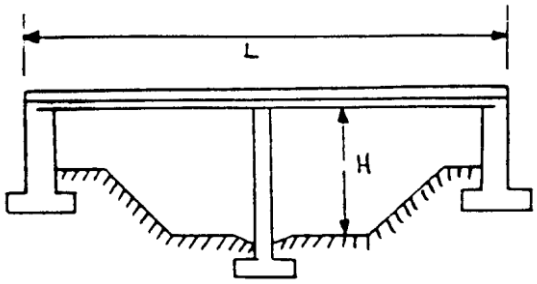


1 to 3 Main Spans (Max. Span 100 Feet [3]

H - Clear Height 14 feet [4]

L - Length Under 400 feet

Class	Layout	Skew [1]	Foundation [2]	Cost Per Sq. Foot
II	L exceeds W Area L x W exceeds 4500 Sq. Feet	0 Degrees-40 Degrees	No Piles	176.50
			On Piles	187.25
		40 Degrees-60 Degrees	No Piles	219.75
			On Piles	273.25
III	W exceeds L Area L x W exceeds 4500 Sq. Feet	0 Degrees-40 Degrees	No Piles	226.75
			On Piles	299.25
		40 Degrees-60 Degrees	No Piles	241.50
			On Piles	310.00
IV	Width 30 - 45 feet Area W x L under 4500 Sq. Foot	0 Degrees-40 Degrees	No Piles	295.50
			On Piles	396.75
		40 Degrees-60 Degrees	No Piles	318.25
			On Piles	416.25



BRIDGES - ENGLISH (2 of 3)

1 to 2 Main Spans (Max. Span 125 feet)

H - Clear Height 14 feet

L - 100 – 250 feet

Layout	Skew (1)	Foundation (2)	Cost Per Sq. Foot
Width at Least 40 feet Minimum Length 100 feet	0 Degrees to 40 Degrees	No Piles	157.00
		Piles at Semi-Stub Abut.	182.00
		Piles at Piers & Semi Stub Abut.	204.50
	40 Degrees to 60 Degrees	No Piles	166.50
		Piles at Semi-Stub Abut.	194.75
		Piles at Piers & Semi Stub Abut.	217.50

	x	x	=
Length	Width	Cost per SF	Bridge Total

BRIDGES - ENGLISH (3 of 3)

1. For skews over 60 degrees it will be necessary to make a special analysis and establish a square meter price comparable to above.

2. For very bad foundation conditions requiring unusual lengths or spacing of piles, it will be necessary to establish a square foot price.

3. For longer spans, adjust the cost per square foot to reflect increased cost of structural members.

4. For span bridges, it is expected the length of the side span will be in- creased in proportion to any increase in height. Because of the resultant increase in deck area, the square foot price will remain approximately the same in the range of heights shown. For extremely high structures (particularly for viaducts), square foot prices will have to be increased.

5. For structures over 400 foot long (viaducts), reduce the cost per square foot if repetitive span length and forming can be used. Reduce by $0.50 for lengths from 400 to 600 feet and by $1.00 for lengths over 600 feet. (Do not forget the adjustments (3) and (4) above on viaducts).

6. For statically indeterminate structures, square meter prices will have to be established.

Structure Description	Calculated Sq. Foot of Bridge Deck	x Cost Per Sq. Foot	= Amount
		Sub Total	=
Clearing Site Bridge *0-3% of Sub Total =			+
*Pick appropriate percent based on the size, type and materials of existing structure		**BRIDGE TOTAL**	=

DRAINAGE (includes inlets and cross drains)

(PER DIRECTION OF WIDENING)	Cost per foot	Amount
feet	x 55	=
	DRAINAGE TOTAL	

LANDSCAPE

The linear foot measurement is for each side of the roadway or ramp that requires landscaping. For example: If a road is widened on one side only the cost = 4.00 per foot. If the road is widened on both sides the cost = 8.00 per foot. If a dualized roadway is widened into the median for each direction of traffic and both outside edges, the cost = 16.50 per foot. When more than one-half of the profile changes by 1.00 feet, the above costs will increase by 25 percent.

Pavement Edge Length in Feet	Cost per pavement edge for Topsoil & Seeding	Amount
	X 4.00	
	LANDSCAPE TOTAL	=

INCIDENTAL ITEMS

Item	x Quantity	x Unit Price	= Amount
Beam Guide Rail		16.75/L.F.	
Fence 6 Foot High		18.25/L.F.	
9” X 16” Conc. Vertical Curb		13.75/L.F.	
15” X 41” Conc. Barrier Curb		50.25/L.F.	
24” X 41” Conc. Barrier Curb		73.25/L.F.	
24” X Variable Conc. Barrier Curb		46/L.F.	
Sign Bridge		308,000	
Cantilever Sign Structure		60,500	
		INCIDENTAL ITEMS TOTAL	=

NOISE ABATEMENT MEASURES

	Unit	Quantity	x Unit Price	= Amount
Noise Wall	L.F.		305	
NOISE ABATEMENT MEASURES TOTAL				=

GENERAL ITEMS

Item	Project Length (mile)	X Cost/mile	= Amount
Field Office		44,260	
Materials Field Laboratory		28,970	
Erosion Control during Construction		64,375	
GENERAL ITEMS TOTAL			=

Classification No. 3 - WIDENING & RESURFACING- SUMMARY Page 1 of 3

Route _____ **Section/Contract#** _____

PM **UPC No.**

Work Type	Totals from previous pages
Earthwork	
Pavement	
Culverts	
Bridges	
Drainage	
Incidental Items	
Landscape	
Noise Abatement	
General Items	
Context Sensitive Design	
PROJECT SUBTOTAL	=

Other Items	Proj. Subtotal Range	Choice	Amount
Lighting, Traffic Stripes, Signs and Delineators		3% of Proj. Subtotal	
Maintenance of Traffic		7% of Proj. Subtotal	
Training		1% of Proj. Subtotal	
Mobilization	Project Cost (Mil.)	% of Proj. Subtotal	
	Less than 1.0	8% of Proj. Subtotal	
	1.0 to 5.0	8% of Proj. Subtotal	
	5.0 & above	8% of Proj. Subtotal	
Progress Schedule	Project Cost (Mil.)	$	
	Less than 2.0	0	
	2.0 to 5.0	6,000	
	5.0 to 10.0	8,000	
	10.0 to 20.0	15,000	
	20.0 to 30.0	30,000	
	30.0 to 40.0	40,000	
	40.0 & above	58,000	
Clearing Site	Project Cost (Mil.)	$	
	Less than 1.0	10,000	
	1.0 to 2.0	30,000	
	2.0 to 5.0	45,000	
	5.0 & above	50,000	
Construction Layout	Project Cost (Mil.)	$	
	Less than 1.0	6,000	
	1.0 to 2.0	8,000	
	2.0 to 5.0	26,500	
	5.0 & above	31,000	
		PROJECT TOTAL	=

Classification No. 3 - WIDENING & RESURFACING- SUMMARY Page 2 of 3

Route		**Section/Contract#**	
PM		**UPC No.**	

CONTINGENCIES & ESCALATION

	x	X	=
Project Total	(1+ C) Contingencies	1 + [0.01 (Y+1) (Y-2)] Y = Number of Years until midpoint of construction duration. If midpoint is less than 2 years no escalation is required.	**Construction Cost for CD Estimate**

Project Cost (Mil.)	Contingencies (C) Percent	Average Construction Duration in Years
0-10	3%	1
Over 10	2.5%	2

CONSTRUCTION ENGINEERING (CE)

Project Cost (Mil.)	% of Construction Cost
Less than 1.0	27.0%
1.0 to 5.0	14.9%
5.0 to 10.0	13.5%
10.0 & above	12.2%
CONSTRUCTION ENGINEERING AMOUNT	

CONTINGENCIES FOR CONSTRUCTION CHANGE ORDER

Total Federal Participating Items in Millions of $	Construction Change Order Contingency Amount
$0 to 0.1	$6,000
0.1 to 0.5	25,000
0.5 to 5.0	25,000 + 4% of amount in excess of $500,000
5.0 to 10.0	205,000 + 3% of amount in excess of $5,000,000
10.0 to 15.0	355,000 + 2% of amount in excess of $10,000,000
15.0 and Above	500,000

For State Funded Projects, Contingencies for Change orders = 0

CONTINGENCIES =

UTILITIES RELOCATIONS BY COMPANIES/OWNERS

	*	=
Construction Cost for CD Estimate	*for Urban use 12%, Rural 5.5%	**Utility Relocation Cost for CD Estimate**

or use utilities detailed estimates as soon as available.
If there are no utility relocations on the project indicate “No Utilities” in the box above.

ROW COST

If there is no ROW cost on the project indicate “No ROW” the box

Classification No. 3 - WIDENING & RESURFACING- SUMMARY Page 3 of 3 - ENGLISH

Route		**Section/Contract#**	
PM		**UPC No.**	

SUMMARY

Construction Estimate for PD	
Construction Engineering (CE)	
Contingencies	
Utilities: Relocations By Companies	
Total Estimate	

Right of Way	

Classification Number 4
(Unit prices current as of 2006)

RESURFACING Spreadsheet Calculation Package

Work Type - EARTHWORK (must be calculated)

Route _____ **Section/Contract#** _____
PM _____ **UPC No.** _____

	Unit	Quantity	x Unit Price	= Amount
Roadway Exc. Unclassified	C.Y.		See (A)	
Removal of Conc. Base & Conc. Surface Courses	S.Y.		15.00	
			EARTHWORK TOTAL	=

A) See Construction Cost Estimate Work Sheet (Attachment 1) for the method to utilize the most recent price information available.

GENERAL ITEMS

Item	Project Length (mile)	x Cost/mile	= Amount
Field Office		44,264	
Materials Field Laboratory		28,970	
		GENERAL ITEMS TOTAL	=

DRAINAGE

Item	Unit	Quantity	x Unit Price	Amount
Reset Casting	Unit		425	=
Inlet *	Unit		2,865	
Pipe *	L.F.		104	
			DRAINAGE TOTAL	

* Any drainage problems to be corrected should be estimated and included.

PAVEMENT

12 FOOT WIDE LANE (from subgrade up)

Pavement Type	Description of Pavement	Cost/Linear Foot
A	10 inch R.C. Pavement	= 156
B	2 inch HMA Surf. Course & 8 inch HMA Base Course	= 61
C	3 inch HMA Surf. Course & 4 inch HMA Base Course	= 46
D	2 inch HMA Surf. Course & 2 inch HMA Base Course	= 22
E	Bridge Approach & Transition Slabs	= 156
	(Resurfacing Portion only F & G)	
F	2 inch HMA Surface Course	= 8.25
G	3 inch HMA Surface Course	= 12
H	Milling 2 inch	= 3

Computation Table for Pavement. Cost

Type	Cost	X Length	X Pavement *W.F.	= Amount
			PAVEMENT TOTAL	=

*Width Factors = Ratio of 12 foot wide lane to actual pavement width.

Example = actual pavement width = 25 foot = 25/12 = 2.08 W.F.

INCIDENTAL ITEMS

Item	x Quantity	x Unit Price	= Amount
Beam Guide Rail		16.75/L.F.	
Fence 6 Foot High		18.25/L.F.	
9” X 16” Conc. Vertical Curb		13.75/L.F.	
15” X 41” Conc. Barrier Curb		50.25/L.F.	
24” X 41” Conc. Barrier Curb		73.25/L.F.	
24” X Variable Conc. Barrier Curb		46/L.F.	
Sign Bridge		308,000	
Cantilever Sign Structure		60,500	
		INCIDENTAL ITEMS TOTAL	=

LANDSCAPE

The linear foot measurement is for each side of the roadway or ramp that requires landscaping. For example: If a road is widened on one side only the cost = 4.00 per foot. If the road is widened on both sides the cost is 8.00 per foot.

Pavement Edge Length in Feet	Cost per pavement edge for Topsoil & Seeding	Amount
	X 4.00	
	LANDSCAPE TOTAL	=

Classification No. 4 - RESURFACING – SUMMARY Page 1 of 3

Route _____ **Section/Contract#** _____
PM _____ **UPC No.** _____

Work Type	Totals from previous pages
Earthwork	
Pavement	
Culverts	
Bridges	
Drainage	
Incidental Items	
Landscape	
Noise Abatement	
General Items	
PROJECT SUBTOTAL	=

Other Items	Proj. Subtotal Range	Choice	Amount
Lighting, Traffic Stripes, Signs and Delineators		2% of Proj. Subtotal	
Maintenance of Traffic		7% of Proj. Subtotal	
Training		1% of Proj. Subtotal	
Mobilization	Project Cost (Mil.)	% of Proj. Subtotal	
	Less than 1.0	8% of Proj. Subtotal	
	1.0 to 5.0	8% of Proj. Subtotal	
	5.0 & above	8% of Proj. Subtotal	
Progress Schedule	Project Cost (Mil.)	$	
	Less than 2.0	0	
	2.0 to 5.0	6,000	
	5.0 & above	8,000	
Clearing Site	Project Cost (Mil.)	$	
	Less than 1.0	10,000	
	1.0 to 2.0	30,000	
	2.0 to 5.0	45,000	
	5.0 & above	50,000	
Construction Layout	Project Cost (Mil.)	$	
	Less than 1.0	6,000	
	1.0 to 2.0	8,000	
	2.0 to 5.0	26,500	
	5.0 & above	31,000	
		PROJECT TOTAL	=

Classification No. 4 - RESURFACING – SUMMARY Page 2 of 3 - ENGLISH

Route _____ **Section/Contract#** _____
PM _____ **UPC No.** _____

CONTINGENCIES & ESCALATION

	x	X	=
Project Total	(1+ C) Contingencies	1 + [0.01 (Y+1) (Y-2)] Y = Number of Years until midpoint of construction duration. If midpoint is less than 2 years no escalation is required.	**Construction Cost for CD Estimate**

Project Cost (Mil.)	Contingencies (C) Percent	Average Construction Duration in Years
0-20	3%	1
Over 20	2%	2
CONSTRUCTION ENGINEERING AMOUNT		

CONSTRUCTION ENGINEERING (CE)

Project Cost (Mil.)	% of Construction Cost
Less than 1.0	20.3%
1.0 to 5.0	14.9%
5.0 to 10.0	10.8%
10.0 & above	9.5%

CONTINGENCIES FOR CONSTRUCTION CHANGE ORDER

Total Federal Participating Items in Millions of $	Construction Change Order Contingency Amount
$0 to 0.1	$6,000
0.1 to 0.5	25,000
0.5 to 5.0	25,000 + 4% of amount in excess of $500,000
5.0 to 10.0	205,000 + 3% of amount in excess of $5,000,000
10.0 to 15.0	355,000 + 2% of amount in excess of $10,000,000
15.0 and Above	500,000

For State Funded Projects, Contingencies for Change orders = 0

CONTINGENCIES =

UTILITIES RELOCATIONS BY COMPANIES/OWNERS

	x 0.025	=
Construction Cost for CD Estimate		**Utility Relocation Cost for CD Estimate**

or use utilities detailed estimates as soon as available.
If there are no utility relocations on the project indicate “No Utilities” in the box above.

Classification No. 4 - RESURFACING – SUMMARY Page 3 of 3

Route		**Section/Contract#**	
PM		**UPC No.**	

ROW COST
If there is no ROW cost on the project indicate "No ROW" the box

SUMMARY	
Construction Estimate for PD	
Construction Engineering (CE)	
Contingencies	
Utilities: Relocations By Companies	
Total Estimate	
Right of Way	

Classification Number 5
(Unit prices current as of 2006)

BRIDGE REPAIR Spreadsheet Calculation Package

PAVEMENT

12 FOOT WIDE LANE (from subgrade up)

Pavement Type	Description of Pavement	Cost/Linear Foot
A	10 inch R.C. Pavement	= 156
B	2 inch HMA Surf. Course & 8 inch HMA Base Course	= 61
C	3 inch HMA Surf. Course & 4 inch HMA Base Course	= 46
D	2 inch HMA Surf. Course & 2 inch HMA Base Course	= 22
E	Bridge Approach & Transition Slabs	= 156
	(Resurfacing Portion only F & G)	
F	2 inch HMA Surface Course	= 8.25
G	3 inch HMA Surface Course	= 12
H	Milling 2 inch	= 3

Computation Table for Pavement. Cost

Type	Cost	X Length	X Pavement *W.F.	= Amount
			PAVEMENT TOTAL	=

*Width Factors = Ratio of 12 foot wide lane to actual pavement width.

Example = actual pavement width = 25 foot = 25/12 = 2.08 W.F.

INCIDENTAL ITEMS

Item	x Quantity	x Unit Price	= Amount
Beam Guide Rail		16.75/L.F.	
Fence 6 Foot High		18.25/L.F.	
9” X 16” Conc. Vertical Curb		13.75/L.F.	
15” X 41” Conc. Barrier Curb		50.25/L.F.	
24” X 41” Conc. Barrier Curb		73.25/L.F.	
24” X Variable Conc. Barrier Curb		46.00/L.F.	
		INCIDENTAL ITEMS TOTAL	=

BRIDGE

Cost to be provided by BUREAU OF STRUCTURAL ENGINEERING

Classification No. 5 - BRIDGE REPAIR- SUMMARY Page 1 of 3

Route _____ **Section/Contract#** _____
PM _____ **UPC No.** _____

Work Type	Totals from previous pages
Earthwork	
Pavement	
Culverts	
Bridges	
Drainage	
Incidental Items	
Landscape	
Noise Abatement	
General Items	
PROJECT SUBTOTAL	=

Other Items	Proj. Subtotal Range	Choice	Amount
Lighting, Traffic Stripes, Signs and Delineators		1% of Proj. Subtotal	
Maintenance of Traffic		7% of Proj. Subtotal	
Training		1% of Proj. Subtotal	
Mobilization	Project Cost (Mil.)	% of Proj. Subtotal	
	Less than 1.0	8% of Proj. Subtotal	
	1.0 to 5.0	5% of Proj. Subtotal	
	5.0 & above	5% of Proj. Subtotal	
Clearing Site	Project Cost (Mil.)	$	
	Less than 1.0	2,000	
	1.0 & above	3,000	
Construction Layout	Project Cost (Mil.)	$	
	Less than 1.0	4,000	
	1.0 & above	6,000	
		PROJECT TOTAL	=

* continued on next page

Classification No. 5- BRIDGE REPAIR- SUMMARY Page 2 of 3

Route		**Section/Contract#**	
PM		**UPC No.**	

CONTINGENCIES & ESCALATION

	x	X	=
Project Total	(1+ C) Contingencies	1 + [0.01 (Y+1) (Y-2)] Y = Number of Years until midpoint of construction duration. If midpoint is less than 2 years no escalation is required.	**Construction Cost for CD Estimate**

Project Cost (Mil.)	Contingencies (C) Percent	Average Construction Duration in Years
0-5	3%	1
Over 5	2.5%	2

CONSTRUCTION ENGINEERING (CE)

Project Cost (Mil.)	% of Construction Cost
Less than 1.0	14.9%
1.0 to 5.0	12.2%
5.0 to 10.0	10.8%
10.0 & above	9.5%

CONSTRUCTION ENGINEERING AMOUNT

CONTINGENCIES FOR CONSTRUCTION CHANGE ORDER

Total Federal Participating Items in Millions of $	Construction Change Order Contingency Amount
$0 to 0.1	$6,000
0.1 to 0.5	25,000
0.5 to 5.0	25,000 + 4% of amount in excess of $500,000
5.0 to 10.0	205,000 + 3% of amount in excess of $5,000,000
10.0 to 15.0	355,000 + 2% of amount in excess of $10,000,000
15.0 and Above	500,000

For State Funded Projects, Contingencies for Change orders = 0

CONTINGENCIES =

UTILITIES RELOCATIONS BY COMPANIES/OWNERS

	x 0.085	=
Construction Cost for CD Estimate		**Utility Relocation Cost for CD Estimate**

or use utilities detailed estimates as soon as available.

If there are no utility relocations on the project indicate “No Utilities” in the box above.

Classification No. 5- BRIDGE REPAIR- SUMMARY Page 3 of 3

Route		**Section/Contract#**	
PM		**UPC No.**	

ROW COST
If there is no ROW cost on the project indicate "No ROW" the box

SUMMARY

Construction Estimate for PD	
Construction Engineering (CE)	
Contingencies	
Utilities: Relocations By Companies	
Total Estimate	
Right of Way	

Classification Number 6
(Unit prices current as of 2006)

INTERSECTION IMPROVEMENT Spreadsheet Calculation Package

EARTHWORK (must be calculated)

Route _____ **Section/Contract#** _____
PM _____ **UPC No.** _____

	Unit	Quantity	x Unit Price	= Amount
Roadway Exc. Unclassified	C.Y.		See (A)	
Removal of Conc. Base & Conc. Surface Courses	S.Y.		15.00	
Borrow Excavation, Zone 3	C.Y.		See (A)	
			EARTHWORK TOTAL	=

A) See Construction Cost Estimate Work Sheet (Attachment 1) for the method to utilize the most recent price information available.

LANDSCAPE

The linear foot measurement is for each side of the roadway or ramp that requires landscaping. For example: If a road is widened on one side only the cost = 4.00 per foot. If the road is widened on both sides the cost = 8.00 per foot.

Pavement Edge Length in Feet	Cost per pavement edge for Topsoil & Seeding	Amount
	X 4.00	
	LANDSCAPE TOTAL	=

PAVEMENT

12 FOOT WIDE LANE (from subgrade up)

Pavement Type	Description of Pavement	Cost/Linear Foot
A	10 inch R.C. Pavement	= 156
B	2 inch HMA Surf. Course & 8 inch HMA Base Course	= 61
C	3 inch HMA Surf. Course & 4 inch HMA Base Course	= 46
D	2 inch HMA Surf. Course & 2 inch HMA Base Course	= 22
E	Bridge Approach & Transition Slabs	= 156
	(Resurfacing Portion only F & G)	
F	2 inch HMA Surface Course	= 8.25
G	3 inch HMA Surface Course	= 12
H	Milling 2 inch	= 3

Computation Table for Pavement. Cost

Type	Cost	X Length	X Pavement *W.F.	= Amount
			PAVEMENT TOTAL	=

*Width Factors = Ratio of 12 foot wide lane to actual pavement width.

Example = actual pavement width = 25 foot = 25/12 = 2.08 W.F.

DRAINAGE

Item	Unit	Quantity	x Unit Price	Amount
Reset Casting	Unit		425	
Inlet *	Unit		2,865	
Pipe *	L.F.		104	
			DRAINAGE TOTAL	

* Any drainage problems to be corrected should be estimated and included.

INCIDENTAL ITEMS

Item	x Quantity	x Unit Price	= Amount
Beam Guide Rail		16.75/L.F.	
Fence 6 Foot High		18.25/L.F.	
9” X 16” Conc. Vertical Curb		13.75/L.F.	
15” X 41” Conc. Barrier Curb		50.25/L.F.	
24” X 41” Conc. Barrier Curb		73.25/L.F.	
24” X Variable Conc. Barrier Curb		46.00/L.F.	
Lighting Assembly (Includes wire, junction box, etc.) *		9,500/Unit	
Meter Cabinet (Lighting one per cross road)		11,000 Unit	
Complete Traffic Signal Installation at Typical Intersection		165,000	
		INCIDENTAL ITEMS TOTAL	=

* For estimating purposes space lights 200 feet apart.

Classification No. 6 - INTERSECTION IMPROVEMENT – SUMMARY Page 1 of 3

Route _____ **Section/Contract#** _____
PM _____ **UPC No.** _____

Work Type	Totals from previous pages
Earthwork	
Pavement	
Culverts	
Bridges	
Drainage	
Incidental Items	
Landscape	
Noise Abatement	
General Items	
PROJECT SUBTOTAL	=

Other Items	Proj. Subtotal Range	Choice	Amount
Lighting, Traffic Stripes, Signs and Delineators		3% of Proj. Subtotal	
Maintenance of Traffic		7% of Proj. Subtotal	
Training		1% of Proj. Subtotal	
Mobilization	Project Cost (Mil.)	% of Proj. Subtotal	
	Less than 5.0	9% of Proj. Subtotal	
	5.0 to 30.0	10% of Proj. Subtotal	
	30.0 & above	11% of Proj. Subtotal	
Clearing Site	Project Cost (Mil.)	$	
	Less than 1.0	15,000	
	1.0 to 2.0	30,000	
	2.0 to 5.0	45,000	
	5.0 to 10.0	115,000	
	10.0 to 20.0	220,000	
	20.0 to 30.0	240,000	
	30.0 to 40.0	250,000	
	40.0 & above	490,000	

Classification No. 6 - INTERSECTION IMPROVEMENT – SUMMARY Page 2 of 3 - ENGLISH

Route		**Section/Contract#**	
PM		**UPC No.**	

Construction Layout	Project Cost (Mil.)	$	
	Less than 1.0	7,000	
	1.0 to 2.0	20,000	
	2.0 to 5.0	42,000	
	5.0 to 10.0	87,000	
	10.0 to 20.0	160,000	
	20.0 to 30.0	270,000	
	30.0 to 40.0	490,000	
	40.0 & above	890,000	
		PROJECT TOTAL	=

CONTINGENCIES & ESCALATION

	x	X	=
Project Total	(1+ C) Contingencies	1 + [0.01 (Y+1) (Y-2)] Y = Number of Years until midpoint of construction duration. If midpoint is less than 2 years no escalation is required.	**Construction Cost for CD Estimate**

Project Cost (Mil.)	Contingencies (C) Percent	Average Construction Duration in Years
0-5	3%	1
Over 5	2.5%	2

CONSTRUCTION ENGINEERING (CE)

Project Cost (Mil.)	% of Construction Cost
Less than 1.0	36.5%
1.0 to 5.0	35.1%
5.0 to 10.0	12.2%
10.0 & above	10.5%
CONSTRUCTION ENGINEERING AMOUNT	

Classification No. 6 - INTERSECTION IMPROVEMENT – SUMMARY Page 3 of 3 - ENGLISH

Route		**Section/Contract#**	
PM		**UPC No.**	

CONTINGENCIES FOR CONSTRUCTION CHANGE ORDER

Total Federal Participating Items in Millions of $	Construction Change Order Contingency Amount
$0 to 0.1	$6,000
0.1 to 0.5	25,000
0.5 to 5.0	25,000 + 4% of amount in excess of $500,000
5.0 to 10.0	205,000 + 3% of amount in excess of $5,000,000
10.0 to 15.0	355,000 + 2% of amount in excess of $10,000,000
15.0 and Above	500,000

For State Funded Projects, Contingencies for Change orders = 0

CONTINGENCIES =

UTILITIES RELOCATIONS BY COMPANIES/OWNERS

	x 0.015	=
Construction Cost for CD Estimate		**Utility Relocation Cost for CD Estimate**

or use utilities detailed estimates as soon as available.

If there are no utility relocations on the project indicate “No Utilities” in the box above.

ROW COST

If there is no ROW cost on the project indicate “No ROW” the box

SUMMARY

Construction Estimate for PD	
Construction Engineering (CE)	
Contingencies	
Utilities: Relocations By Companies	
Total Estimate	
Right of Way	

Classification Number 7
(Unit prices current as of 2006)

SAFETY & TRAFFIC CONTROL Spreadsheet Calculation Package

PAVEMENT

12 FOOT WIDE LANE (from subgrade up)

Pavement Type	Description of Pavement	Cost/Linear Foot
A	10 inch R.C. Pavement	= 156
B	2 inch HMA Surf. Course & 8 inch HMA Base Course	= 61
C	3 inch HMA Surf. Course & 4 inch HMA Base Course	= 46
D	2 inch HMA Surf. Course & 2 inch HMA Base Course	= 22
E	Bridge Approach & Transition Slabs	= 156
	(Resurfacing Portion only F & G)	
F	2 inch HMA Surface Course	= 8.25
G	3 inch HMA Surface Course	= 12
H	Milling 2 inch	= 3

Computation Table for Pavement Cost

Type	Cost	X Length	X Pavement *W.F.	= Amount
			PAVEMENT TOTAL	=

*Width Factors = Ratio of 12 foot wide lane to actual pavement width.

Example = actual pavement width = 25 foot = 25/12 = 2.08 W.F.

INCIDENTAL ITEMS

Item	x Unit Price	x Quantity	= Amount
Beam Guide Rail	16.75/L.F.		
Fence 6 foot High	18.25/L.F.		
Quad Guard	27,500/Unit		
Sign Bridge	308,000		
Cantilever Sign Structure	60,500		
Lighting Assembly (Includes wire, junction box, etc.) *	9,500/Unit		
Meter Cabinet (Lighting one per cross road)	11,000/Unit		
Complete Traffic Signal Installation at Typical Intersection	165,000		
		INCIDENTAL ITEMS TOTAL	=

* For estimating purposes space lights 200 feet apart.

EARTHWORK & LANDSCAPE

	Unit	Quantity	x Unit Price	= Amount
Roadway Exc. Unclassified	C.Y.		26.75	
Removal of Conc. Base & Conc. Surface Courses	S.Y.		15.00	
Borrow Excavation, Zone 3	C.Y.		15.25	
			EARTHWORK TOTAL	=

Roadway Excavation Unclassified and Borrow Excavation Zone 3 should be calculated on a job-to-job basis depending on need. The prices include Topsoil and Seeding required.

Classification No. 7 - SAFETY & TRAFFIC CONTROL – SUMMARY Page 1 of 3

Route _____ **Section/Contract#** _____
PM _____ **UPC No.** _____

Work Type	Totals from previous pages
Earthwork	
Pavement	
Culverts	
Bridges	
Drainage	
Incidental Items	
Landscape	
Noise Abatement	
General Items	
PROJECT SUBTOTAL	=

Other Items	Proj. Subtotal Range	Choice	Amount
Lighting, Traffic Stripes, Signs and Delineators		3% of Proj. Subtotal	
Maintenance of Traffic		7% of Proj. Subtotal	
Training		1% of Proj. Subtotal	
Mobilization	Project Cost (Mil.)	% of Proj. Subtotal	
	Less than 1.0	8% of Proj. Subtotal	
	1.0 to 5.0	8% of Proj. Subtotal	
	5.0 & above	8% of Proj. Subtotal	
Progress Schedule	Project Cost (Mil.)	$	
	Less than 2.0	0	
	2.0 to 5.0	6,000	
	5.0 & above	8,000	
Construction Layout	Project Cost (Mil.)	$	
	Less than 1.0	6,000	
	1.0 to 2.0	8,000	
	2.0 to 5.0	26,500	
	5.0 & above	31,000	
		PROJECT TOTAL	=

* continued on next page

Classification No. 7 - SAFETY & TRAFFIC CONTROL - SUMMARY Page 2 of 3 - ENGLISH

Route _____ **Section/Contract#** _____
PM _____ **UPC No.** _____

CONTINGENCIES & ESCALATION

	x	X	=
Project Total	(1+ C) Contingencies	1 + [0.01 (Y+1) (Y-2)] Y = Number of Years until midpoint of construction duration. If midpoint is less than 2 years no escalation is required.	**Construction Cost for CD Estimate**

Project Cost (Mil.)	Contingencies (C) Percent	Average Construction Duration in Years
0-5	3%	1
Over 5	2.5%	2

CONSTRUCTION ENGINEERING (CE)

Project Cost (Mil.)	% of Construction Cost
Less than 1.0	21.6%
1.0 to 5.0	12.2%
5.0 to 10.0	12.2%
10.0 & above	12.2%
CONSTRUCTION ENGINEERING AMOUNT	

CONTINGENCIES FOR CONSTRUCTION CHANGE ORDER

Total Federal Participating Items in Millions of $	Construction Change Order Contingency Amount
$0 to 0.1	$6,000
0.1 to 0.5	25,000
0.5 to 5.0	25,000 + 4% of amount in excess of $500,000
5.0 to 10.0	205,000 + 3% of amount in excess of $5,000,000
10.0 to 15.0	355,000 + 2% of amount in excess of $10,000,000
15.0 and Above	500,000

For State Funded Projects, Contingencies for Change orders = 0

CONTINGENCIES =

UTILITIES RELOCATIONS BY COMPANIES/OWNERS

	x 0.10	=
Construction Cost for CD Estimate		**Utility Relocation Cost for CD Estimate**

or use utilities detailed estimates as soon as available.
If there are no utility relocations on the project indicate “No Utilities” in the box above.

Classification No. 7 - SAFETY & TRAFFIC CONTROL - SUMMARY Page 3 of 3 - ENGLISH

Route		**Contract#**	
PM		**UPC No.**	

ROW COST
If there is no ROW cost on the project indicate "No ROW" the box

SUMMARY

Construction Estimate for PD	
Construction Engineering (CE)	
Contingencies	
Utilities: Relocations By Companies	
Total Estimate	
Right of Way	

Attachment 1 -_Construction Cost Estimate Work Sheet

Utilize the Bid Price Report to complete

Route ______________________________ **Section/Contract#** __________________________

		Reference Project Information				
		Route & Section				
		Municipality				
		County				
		Total Bid Price				
Item	Item	Bid Date				
No.	Description	Work Class				
		Quantity				
Unit Price for Estimating		Unit Price				
		Total Price				
		Quantity				
Unit Price for Estimating		Unit Price				
		Total Price				
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Unit Price for Estimating		Unit Price				
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		Quantity				
Unit Price for Estimating		Unit Price				
		Total Price				

Attachment 2 - Federal Non-Participating Construction Cost Estimation Work Sheet

Items of Work	**Amount**
Approach slabs with any of the following conditions: (a) if one-way traffic loading is less than 500 80-kN equivalent single axle load applications per day; (b) posted speed limit is less than 35 m.p.h.; (c) the abutments are not supported on pile foundations.	=_____
Fishing piers (or bridges) and pedestrian walkways for recreational access.	=_____
Greater than a 2 to 1 ratio of mitigation for wetland sites. FHWA sometimes participates in greater than 2 to 1 replacement if the impact is significant. Contact Project Manager for guidance.	=_____
Sometimes the use of liners for Wetland Mitigation Sites as they do not permit ground water recharge. Contact Project Manager for guidance.	=_____
Waterway openings and net fill requirements mandated by NJDEP when they differ from FHWA requirements.	=_____
Structures less than 20 feet in span if BR/BH funds are being utilized for the project.	=_____
Sidewalks on bridges when there are no sidewalks on the approaches for pedestrians. Contact Project Manager for guidance.	=_____
Maintenance dredging if the dredged material is not used as a fill.	=_____
Maintenance operations such as cleaning existing pipes, drainage structures, ditches, repairing impact attenuators, mowing etc. FHWA sometimes participates in this work. Contact Project Manager for guidance.	=_____
Items of work paid for by other agencies or private developers.	=_____
Sometimes Memorial and/or Vanity Plaques on structures.	=_____
Type II Noise Barriers	=_____
BR/BH funds for approach work past the touchdown points for new / rehabilitated structures.	=_____
Proprietary items without proper justification. Contact Project Manager for guidance.	=_____
Additional items not listed above. (see next page)	=_____

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Total Federal Non-Participating Items =_____