Cost Estimating Guide

2008 Update

CONTRA COSTA
transportation
authority

CONTRA COSTA TRANSPORTATION AUTHORITY
2008 Update of the Cost Estimating Guide

Summary of Changes

CCTA's *Cost Estimating Guide* (*Guide*) was last updated in July 2003. That version, as well as previous ones, contained specific unit prices for typical project bid items, and "rule of thumb" percentages to use for estimating a variety of other project elements. Global and domestic markets are more unpredictable than ever – as evidenced by the very high escalation in construction costs over the first few years since the last update of the Guide, and notable drops in construction costs more recently. For this reason, the CCTA will no longer recommend specific prices or a specific escalation rate to use in the development of project cost estimates. There are many resources available to assist in determining appropriate unit costs when developing cost estimates. As such, CCTA has provided a list of some of these resources at the end of this Guide. It is expected that project proponents will use up-to-date cost data from one of the listed sources, or from another credible source, in developing their project cost estimates. Escalation rates should be justifiable.

With the elimination of published unit prices, the accompanying spreadsheet template has also been modified. The "rule of thumb" allowances are still provided in the spreadsheet and can be modified if appropriate. The *Guide* has been updated to reflect these changes.

The major revisions included in the 2008 update are:

1. Specific unit prices are no longer provided. Instead, references (with links, where available) are provided at the end of the *Guide* as potential resources for up-to-date cost data.
2. References to metric units have been removed, as Caltrans no longer uses the metric system. Accordingly, Appendix D (Conversion Factors) is no longer included in the Guide.
3. The *Guide* is now available primarily on-line. There is no longer a diskette (formerly Appendix E) associated with it; instead, the spreadsheet template can be downloaded from the CCTA website. (www.ccta.net). A hard copy of the Guide, along with a CD containing the spreadsheet, is available upon request.
4. There is no longer a discussion of Value Engineering because it is the Authority's policy that value engineering is inherent in the design process and is reinforced during the Peer Review process.
5. There is no longer a discussion of Estimate Deliverables because there is no formal submittal of a cost estimate outside of the Peer Review process.
6. Typographical errors have been corrected and there has been overall editing for clarity.
7. Text has been revised throughout to conform to the revisions identified above.

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CONTRA COSTA TRANSPORTATION AUTHORITY

MEASURES C AND J

COST ESTIMATING GUIDELINES

PROCEDURE

1.0 INTRODUCTION

The *Cost Estimating Guide (Guide)* sets out a consistent framework for estimating project costs at the conceptual level. Project proponents are encouraged to use this *Guide* when preparing cost estimates for Measure C or J funded projects. Sound financial programming requires consistent and reasonable cost estimates. Accurate cost estimates help project proponents establish reliable funding plans for their projects and allow the Authority to program sufficient funding to deliver the projects.

2.0 ESTIMATING METHODOLOGY

The *Cost Estimating Guide* provides a description of the procedures to be used in estimate preparation for Measures C and J projects. They are described in the following paragraphs.

Conceptual estimates are prepared during the early planning and project development phases when detailed information about the project is unknown. **Detailed estimates** are prepared during the design phases of project development when more detailed engineering is being performed.

CCTA provides a template for preparing Conceptual Cost Estimates that can be downloaded from the Authority's website (www.ccta.net) or requested on a CD. Instructions are included for using the template are included in Appendix A. The template was prepared using Microsoft Excel (Version 7.0) software. Information regarding the basis for estimating various bid items at the conceptual level is provided Appendix B. Forms C-1 through C-3 were created in Microsoft Word (Version 7.0).

The Conceptual Cost Estimating Reference (Appendix B)

The Conceptual Cost Estimating Reference (Appendix B) includes definitions of cost items and the basis for unit prices. Unit prices are specified in several forms used in preparing estimates. Forms B-1, Conceptual Cost Estimate Summary, and B-2, Conceptual Cost Estimate, are shown at the end of Appendix B.

Forms B-1 and B-2 are the output from the Excel-based Cost Estimating Spreadsheet. The Conceptual Cost Estimating Reference is applicable for three types of cost estimates:

1) Initial Estimate, prepared when the project is conceived;
2) Project Study Report (PSR) Estimate, prepared as part of the PSR or other scoping document; and
3) Project Report/Environmental Document (PR/ED) Estimate, prepared as part of the Project Report. These estimates are explained in greater detail in Section 5.

The spreadsheet template no longer contains specific unit prices, although it still contains "rule of thumb" numbers for project elements that are typically estimated as percentages at the conceptual level. The percentages used in the Excel estimating template are to be used as a guide and should not interfere with good estimating practice. The estimator may deviate from the *Guide* if better information is available.

Unit pricing should be carefully considered. Prices can vary greatly for the same material in different areas or quantity, and at the time of this writing, markets appear to be somewhat volatile. There are several sources of cost data that can be used to determine appropriate unit prices. The California Department of Transportation (Caltrans) publishes its Contract Cost Data reference annually, documenting actual bid prices from construction contracts issued in the previous year. A detailed discussion of the Caltrans Contract Cost Database reference follows in the Detailed Cost Estimate section below.

Proponents should document the scope of the project, basis for quantities, basis for pricing, assumptions, inclusions, and exclusions as accurately as possible. The cost estimate should be carefully reviewed before being finalized. A completed and signed Estimate Review and Sign-Off Sheet (Form C-3) is to accompany the Conceptual Estimate. Form C-3 is provided in Appendix C.

Detailed Cost Estimate *(Please refer to Caltrans Contract Cost Database)*

Proponents who choose not to use the Caltrans Contract Cost Data reference for developing detailed cost estimates may use other sources, but should justify the basis of their unit prices. Detailed estimates are to be summarized using the format of Form B-1 - Conceptual Cost Estimate Summary.

The Caltrans Contract Cost Database is a summary of cost (by item) for highway construction projects. A six-digit item code has been assigned to each standard contract item. The first two digits

of the item code normally relate each corresponding contract item to its respective section of the California Department of Transportation Standard Specifications. Prices shown in this summary are the mathematically weighted average of the low bidders' prices and are affected by location (Caltrans District Number), time, quantity in the job and size of the item (relative to the size of the job).

This Contract Cost Data is published annually by the Department of Transportation, Office of Office Engineer. A copy can be purchased by sending a request and remittance to:

California Department of Transportation
Publication Distribution Unit
1900 Royal Oaks Drive
Sacramento, CA 95815-3800
Phone Number: (916) 445-3520
or
http://caltrans-opac.ca.gov/publicat.htm

Caltrans also makes the database available online. As of this printing, it can be found at: http://sv08data.dot.ca.gov/contractcost/.

3.0 SCOPE OF THE ESTIMATE

The project should be developed in sufficient detail to support the type of cost estimate prepared. In some cases it may be necessary to do additional work to adequately define the project scope. For example, it may be necessary to obtain a geotechnical report, information on potential for contaminated soil, or as-built drawings of existing facilities to refine cost estimates.

Any estimate should include a summary narrative describing the scope of work upon which the estimate is based.

4.0 TYPES OF ESTIMATES

Seven project development milestones have been identified for which cost estimates may be prepared. They follow the normal chronological course of events associated with developing a capital project. The seven types of estimates corresponding to these milestones comprise two major categories: Conceptual Estimates and Detailed Estimates. These are shown below.

Conceptual Estimates
- Initial Estimate
- PSR Estimate
- PR/ED Estimate

Detailed Estimates
- 35% Submittal Estimate
- 65% Submittal Estimate
- 100% Submittal Estimate
- Final Engineer's Estimate

During the Authority's peer-review process, a detailed cost estimate is required to be submitted along with the design plans.

Conceptual Cost Estimates

Initial Estimate
An initial estimate, based upon the project concept, is usually the first cost estimate prepared for a new project. The project may not be sufficiently defined to allow use of the *Guide*. If the *Guide* is not used, the proponent should state how the initial estimate was derived.

Project Study Report (PSR) or equivalent Estimate
A PSR will generally be required for all projects involving Caltrans facilities. The estimate for a Project Study Report or any similar scoping document should be developed using the format of the *Conceptual Cost Estimate Summary* (Form B-1) and *Conceptual Cost Estimate* (Form B-2). Both forms can be found in Appendix B and are contained in the spreadsheet template.

Note: Caltrans has a defined Project Study Report Cost Estimate format.

Project Report/Environmental Document (PR/ED) or equivalent Estimate
The PR/ED Estimate is based upon engineering studies prepared in support of the environmental document.

Note: Caltrans has a defined Project Report Cost Estimate format.

Detailed Cost Estimates

35% Submittal Estimate is based upon documents prepared for the 35% design submittal. This submittal will define the major elements of the project

65% Submittal Estimate is required for projects for which sufficient detail was not provided for major work elements in the 35% Submittal Estimate or if the project scope has changed significantly.

100% Submittal Estimate is based upon documents prepared for the 100% design submittal. Costs evaluated for this submittal address the final definition of the project, completed specifications, and a detailed implementation schedule. The estimate should also consider any special terms or conditions in the contract.

Final Engineer's Estimate is based on the advertised contract bid documents and any subsequent addenda. Documents upon which this estimate is based include any review comments, which may have been incorporated into the project since preparation of the 100% estimate. The Final

Engineer's Estimate may be the same as the 100% Submittal Estimate if no changes have occurred nor addenda issued.

5.0 PROCEDURES FOR PREPARING CONCEPTUAL ESTIMATES

In order to obtain consistent cost estimates, the Authority has established a standard project work breakdown structure and has developed "rule of thumb" allowances for certain work elements based on typical state highway projects (See Appendix B). Proponents should select unit prices for bid items by using the Caltrans Contract Cost Database, the RS Means Guide, or another professionally acceptable source for construction cost data. Descriptions and definitions of typical bid items are included in Appendix B and should be referred to during the development of the estimate.

Estimate Format

Conceptual estimates can be developed using the format of the *Conceptual Cost Estimate Summary* (Form B-1) and *Conceptual Cost Estimate* (Form B-2). Both forms can be found in Appendix B and are contained in the spreadsheet template.

Cost elements contained on Form B-2 should be adequate for most conceptual estimates for Measures C or J projects. Blank spaces are provided on the form for items of work not listed under each major category of cost.

Form B-1 is a total project cost summary containing estimates of both basic contract and other costs. When the spreadsheet software is used, costs associated with contract work from Form B-2 are automatically summarized into 6 major categories of work on Form B-1. Items not in the contract and other markups are added below the line. See Section 7.0, *Below the Line Costs*, for a detailed discussion of these items. The Excel spreadsheets produce forms B-1 and B-2.

Quantity Takeoff

Quantity takeoffs should be prepared using the prescribed format and should be based on available conceptual engineering. Appendix B, *Basis of Quantity and Unit Cost Measure*, describes the basis of measurement to be used. Quantity takeoffs may be calculated on any standard takeoff sheet or by using their own spreadsheet. A sample takeoff sheet is provided as Form C-1 in Appendix C.

Pricing

The conceptual cost spreadsheet developed by the Authority no longer contains *Guide* unit costs in Form B-2. It does however provide allowances for various soft costs and those bid items which are typically estimated as a percentage in the conceptual phase of a project. These *Guide* allowances are preset in the spreadsheet template. Appendix B contains a description of the assumptions supporting

the *Guide* allowances. These are intended as a guide and may be adjusted if deemed appropriate. All allowances that deviate from the *Guide* should be highlighted by shading the proponent cost cell. When the estimator feels it is necessary to make significant deviations from the *Guide*, an explanation of deviations should be provided.

On occasion, it may be necessary to develop the cost of a particular line item in more detail (especially if the unit is composed of several items) or to demonstrate the derivation of a unit price should the *Guide* not be used. Form C-2, Unit Price Estimate, is provided for this purpose. The form may also be used to explain the derivation of a lump sum item.

6.0 BELOW THE LINE COSTS

Items below the "Total Contract Cost" shown on the estimate summaries (Form B-1) are termed "Below The Line Costs". These costs are defined as follows:

Work by Others

Certain items of work may be excluded from the work of the prime construction contract. For instance, relocation of a railroad track or a gas line may be accomplished by force account by the railroad or the local utility, or the owner may procure an item and provide it to the contractor for installation. Detailed information should be entered on Form B-2. The total cost shown on the estimate summary will automatically adjust.

Land and Right-of-Way

Initially, right-of-way to be acquired for construction of the project should be approximated using unit prices for comparable land values. Once the proposed take is specifically defined, special expertise is required to develop the cost. The appropriate detail should be entered on Form B-2. The form allows cost input for land, relocation costs, land acquisition services, hazardous material remediation, and contingencies. The total will be automatically included on the estimate summary.

Design Development Contingency

Contingency is an allowance to cover the unknowns inherent in design development and imperfections in estimating. The Contingency Guidelines in Table 1 show the contingency that is recommended to be used during each phase of project development as a percentage of estimated construction cost. The contingency decreases as more detailed engineering is performed. This table should be used to determine the appropriate contingency percentage, unless there is justification for deviation from these guidelines.

For conceptual level estimates the design development contingency is typically set at 25%. This percentage is applied automatically on the preceding subtotal shown on form B-1. The contingency

section in the spreadsheet template provided along with this *Guide* should be used during the corresponding project development phase. Note that the recommendations below allow for selection of a lower or higher contingency at some of the early phases of project development. The rule of thumb should be to assume the higher value for contingency unless there is some specific justification for reducing it. A small project that is well-defined from the outset may be justified in using 15% contingency at the PR phase, for example.

Type	Estimate Description	Probable Contingency as to Percentage of Construction Cost
1	Initial *or* PSR	•
2	PSR *or* PR	•
3	PR *or* 35% Submittal	•
4	35% Submittal *or* 65% Submittal	•
5	100% Submittal *or* Engineer's Estimate	•
		25% 20% 15% 10% 5%

Table 1: Contingency Guidelines

Engineering and Management

Included in this category are pre-design, design engineering, construction staking, and construction management services. Pre-design services include engineering and environmental studies necessary to obtain environmental clearance.

Construction Contingency

This is a reserve to cover construction and engineering change orders. The estimate summaries anticipate that 10% of project cost is a reasonable amount to allow for this item. This percentage may be overridden if it is deemed appropriate.

8.0 QUALITIES OF A GOOD COST ESTIMATE

In general, a cost estimate should attempt to answer a series of questions as shown below:

- **Scope:** What is included? What is excluded? Does the scope of the estimate match the scope of defining documents? Any variations must be identified and the reason for the deviation explained.

- **Quantities:** Are the quantities reasonable? Is the method clear and easy to follow? Has the math been checked? Do the totals come forward to the summaries? A good technique is to use parametric checks from other experience, i.e. 1000 pounds of reinforcing steel per cubic yard of concrete would be extraordinary.

- **Pricing:** Are the unit prices reasonable? Do the allowances follow the *Guide* pricing? If not, are the explanations reasonable? Does the pricing cover the type and quality of materials contemplated? Are incidentals like sales tax and freight covered? Have unusual working conditions been factored into the pricing?

- **Major items:** The major items of work should be investigated with care. A faulty assumption on a major work item will have a large effect on project cost.

- **Presentation:** Is the estimate presentation clear? Is it easy to follow? Is the basis of the estimate documented in a concise fashion so that it will be readily understood by an unfamiliar party?

9.0 CONCLUSION

The *Cost Estimating Guide* is intended to assist project proponents in developing reliable cost estimates for projects that may receive Measures C or J funding. Persons using the *Guide* are encouraged to suggest improvements or corrections to Contra Costa Transportation Authority at Hookston Square, 3478 Buskirk Avenue, Suite 100, Pleasant Hill, CA 94523.

10.0 RESOURCES

The following resources are provided for the convenience of project proponents and were current at the time of this writing. CCTA is not responsible for any changes to others' websites that might render the information below obsolete or incorrect.

- Caltrans Cost Estimating Resources
  Caltrans provides a number of resources for preparing cost estimates at various stages of project development. For an overview of cost estimating resources, try the Caltrans Cost

Estimating webpage, which contains a "…collection of policy, tools, guidance, training, best practices and lessons learned… …to assist in the development of cost estimates that are complete and accurate, reflecting the true scope of work to be performed and reflecting current market trends". http://www.dot.ca.gov/hq/oppd/costest.htm.

- Caltrans Contract Cost Database
  Caltrans maintains a database of contract bid prices, which can be found at http://sv08data.dot.ca.gov/contractcost/.

- RS Means Construction Publishers and Consultants
  RS Means publishes several resources for construction cost data. These may be purchased by contacting RS Means, 63 Smiths Lane, Kingston, MA 02364-0800. Phone: (781) 422-5000.

MEASURES C AND J

COST ESTIMATING USING THE SPREADSHEET TEMPLATE

A Conceptual Cost Estimate template, in standard English units, has been prepared for proponent use. The template is available on the CCTA website and can be used with Microsoft Excel version 7.0 or later. The Excel template filename is designated as follows:

CONCEPTUAL COST ESTIMATE .....**CONCEPT-EST.XLS**

This template will assist you in preparing Estimate Details and an Estimate Summary. Instructions on opening the template in **Microsoft Excel** are explained below.

USING THE MICROSOFT EXCEL SPREADSHEET

1. Download the spreadsheet from the CCTA website: www.ccta.net and open the file.
2. Go to the worksheet labeled "CONC-EST-CCTA" and scroll down to line 373 to input or revise items a. through k. below.

a.	**Revision Number:**	Use 0 if this is the first estimate you have prepared for this project. Add the revision number, if this is a revision.
b.	**Date:**	The computer will automatically set the date to today's date. If you wish to change the date (i.e. if your computer is not set to the correct date), enter the date in the following format: 'dd-mmm-yy (e.g. '19-nov-98).
c.	**By:**	Who prepared the Estimate.
d.	**Project Name:**	Project Title.
e.	**Type of Estimate:**	Refer to Section 4.0, **Types of Estimates**, for types of estimates.
f.	**Proponent:**	Project proponent.
g.	**Source of Cost Data:**	Source for unit prices.
h.	**Design Consultant:**	If applicable.
i.	**Contract No:**	If applicable.
j.	**Percent for Contingency:**	25% is used as a default. This may be modified by referring to Table 1, Contingency Guidelines and the

corresponding discussion in Section 7.0, **Below the Line Costs**.

k. Percent for Construction Contingency: 10% is used as a default. This may be modified by referring to Table 1, Contingency Guidelines and the corresponding discussion in Section 6.0, **Below the Line Costs**.

4. The following steps will assist you in entering your estimate data.

   a. For each item, enter the unit price you have selected, making sure that the price is based on the same unit of measure that you are using for that item.

   b. When the quantity for a particular item is input, the Total Cost for that Item will be calculated automatically.

   c. Items for which the "unit" is a percentage do not require an input in the quantity field. If you wish to change units from percentage to another unit of measure, create a new line item. Input the unit of measure, price, and quantity. For the quantity, enter a "1" for lump sum, or the quantity for any other unit of measure.

   d. If an item needs to be added, space down to the next blank item for that particular Group Code and input the Item Code, Item Description, Unit, Price and Quantity.

   e. For line items in group code 09, Engineering and Management, space is provided to add additional categories. These are set up to be lump sum entries. Proponents may override the lump sum units with % calculations by the appropriate Excel manipulations should this change be desired. For lump sum entries place a 1 in the quantity field and a dollar amount in the proponent price column.

   f. To move from one part of the worksheet to another, use the <F5> key as follows: Enter **REV** to go to the initial data entry screen; **_1**, **_2**, etc. to go to Group Codes 01, 02, etc. and **S** to go to the summary screen.

5. Save your work.

6. Print your reports. In order to print both the summary sheet, B-1, and the detailed estimate, B-2, be sure to select "Entire Workbook" in the print options dialog box.

CONCEPTUAL COST ESTIMATING REFERENCE

BASIS OF QUANTITY AND UNIT COST MEASURE

ADVANCE WORK

Temporary Work (Primarily for maintaining traffic)

Temporary work, detours, etc., includes all labor materials and incidental costs for the installation and removal of all items necessary to maintain reasonable flow of traffic and safety during construction of the proposed work. The scope includes, but is not limited to, such items as temporary pavement, signs, signals, barriers, striping, traffic control, traffic management plan, etc.

Unit of Measure: LS (lump sum).
Guideline Unit Cost: 10% of Total Construction Bid Items

For freeways, interchanges, or major arterial projects that will require significant detours or construction staging, additional costs may need to be included in the estimate.

Maintenance of Utilities

Maintenance of utilities includes all labor, materials and incidental costs for temporary relocations, supports, protection, and restoration of electrical or mechanical utilities located in the work areas as required to maintain service with minimal or no interruption. This does not include utility relocation, which is discussed under land and right-of-way costs.

Unit of Measure: LS (lump sum).
Guideline Unit Cost: 3% of Total Construction Bid Items

Particular attention should be given to these items. Costs could be significantly larger than the percents shown, especially if project requires significant rehabilitation and involves traffic management, detours and construction staging.

Mobilization

Mobilization provides reimbursement of cost to the contractor prior to "move in".

Unit of Measure LS (lump sum).
Guideline Unit Cost 10% of Total Construction Bid Items

Clearing and Grubbing

Clearing and grubbing includes all labor, materials and incidental costs for clearing from the entire area of the construction right of way all vegetation, shrubs, trees including the removal of stumps and disposal of the cleared items.

Unit of Measure: 2.5% of Total Construction Bid Items

Demolition

Demolition includes all labor, materials and incidental costs for the removal of all items within the right of way that interfere with the construction of the proposed work. Exceptions are those items which are to remain functional during construction and which will be an integral part of the finished project. Demolition includes the cost of hauling and disposing of all demolished items. Removal and disposal of hazardous materials should be included under miscellaneous costs.

Demolition of Typical Items (Excluding Bridges, Major Structures, & Buildings):

Unit of Measure: LS (lump sum).
Guideline Unit Cost: 2% of Total Construction Bid Items

Demolition of Bridges, Major Structures, & Buildings:

Removal of buildings and miscellaneous structures can involve significant costs and should be estimated separately.

Unit of Measure: LS (lump sum).

EARTHWORK

General

Earthwork includes all labor, materials and incidental costs for all earthwork operations including haulage, testing and disposing of excess excavation, backfill compaction, and grading. Excavation for drainage ditches will be included under "Drainage".

Earthwork (Roadway Excavation) costs can vary significantly between larger and smaller projects. Often for smaller projects, the significant portion of the roadway excavation is associated with grading for the roadway pavement section. This is more labor intensive and therefore more costly than for larger projects with a larger volume of mass earthwork. It is important to use a unit price that is consistent with the size of the project.

Roadway excavation
Roadway excavation includes but is not limited to, excavation, embankments using excavated materials, compaction for embankments, haulage, and disposal of over-excavation.

Unit of Measure: CY (cubic yard) of excavated material

The unit price per cubic yard is typically based on a cut and fill operation in soft soil. If conditions suggest that rock excavation will be required, an appropriate allowance should be included.

Imported Borrow
Imported borrow includes, but is not limited to, imported material, its placement and compaction, including haulage.

Unit of Measure: CY (cubic yard) of imported borrow in place

Typically, the unit price per cubic yard is based on the availability of suitable borrow material within 10 miles. Similar to Roadway Excavation, unit prices for Imported Borrow can vary significantly between smaller and larger volume projects and should be selected to be consistent with the specific project.

Erosion Control
Erosion Control includes all slope and unpaved areas that will not be landscaped. It consists of, but is not limited to, placing soil retention netting, hydro-seeding and mulching or, where required. Other methods of erosion control, such as rip-rap, concrete or asphaltic cover need to be estimated separately.

Unit of Measure: AC (acres) of applicable area

DRAINAGE

General
Drainage includes all labor, material and incidental costs for providing adequate drainage of the roadway, and all connections to existing storm sewers, modifications to existing catch basins and manholes as required.

Drainage Ditches
Drainage ditches include excavation and lining, or seeding as required.

Unit of Measure: LF (linear feet) of ditch

Drainage ditches vary in size, and therefore, cost per linear foot. A large ditch might be concrete lined with an average cross section of 3 ft bottom width, 9 ft top width, and 3 ft depth; while a small ditch might be a concrete lined V-ditch with a 1:1 slope and a top width of 4 ft. It is important that the unit price selected is appropriate for the size of ditch that will be required. Roadside ditches would typically only be appropriate in rural or semi-rural settings, as urban projects would normally have curb & gutter.

Reinforced Concrete Pipe (RCP)
Reinforced concrete pipe includes manufacturing, hauling, excavation, and placing the RCP, endwalls, all connections and modifications to existing storm drain systems, as required.

Unit of Measure: LF (linear feet) of RCP

Drainage Structures (Manholes, Catch Basins)
Drainage Structures include excavation, furnishing and installing manholes and catch basins (inlets) with covers and grates.

Unit of measure: EA (each)

Unit prices vary for Manholes and Catch Basins (Inlets), and for smaller and larger projects.

Box Culverts (RCB)
Box culverts include excavation, furnishing and placing the culvert, and end structures. Because box culverts vary greatly in size, it is important to use a unit cost that is appropriate for the specific project.

Unit of Measure: SF (square feet) of box culvert

PAVEMENT

General

Pavement includes all labor, materials and incidental costs for compaction, fine grading, and placing sub-base, base, wearing and finish course. Striping and pavement markings, including all delineator buttons and reflectors, will be estimated separately.

Typically city street and arterial projects (non-freeway/expressway) will include curbs & gutters, sidewalks, and sometimes raised medians. Estimate line items are included for these items.

Roadway Pavement Sections and corresponding costs vary significantly between Freeway/Expressways and local streets and arterials. Costs also vary between smaller and larger projects. It is important to select unit costs that consider these variations.

Asphalt Concrete Pavement (AC)

Asphalt Concrete pavement should include the area of main road, shoulders, and ramps. Typical road sections might be as follows:

Local Streets and Arterials:

Asphalt Concrete (Type A)	0.5 ft
Class 3 Aggregate Base	0.75 ft
Class 4 Aggregate Sub-base	1.0 ft

Freeway:

Asphalt Concrete (Type A)	0.67 ft
Class 3 Aggregate Base	0.83 ft
Class 4 Aggregate Sub-base	1.33 ft

Unit of Measure: SF (square foot) of asphalt concrete pavement

The Asphalt Concrete pavement unit price should also include the necessary surface coating(s) such as prime coat and tack coat.

Portland Cement Concrete Pavement

Portland Cement Concrete pavement should include the total area of Portland Cement Concrete pavement based on a typical structural section. The structural section below is typical for a Long Life

(40-year Design Life) pavement, as the majority of freeways in Contra Costa County will require it. Normal (20-year Design Life) pavement would be approximately 20% less in unit cost.

Portland Cement Concrete	1.00 ft
Lean Concrete Base (LCB)	0.50 ft
Class 4 Aggregate Sub-base	0.75 ft

Unit of Measure: SF (square foot) of PCC pavement

Pavement Striping & Markings

Pavement striping includes striping with reflective paint, all delineator buttons and reflectors required.

For *Conceptual* Pavement Striping & Markings Costs:

Unit of Measure: 2% of Total of Group Codes 02, 04, & 06

For a more detailed Pavement Striping Cost:

Unit of Measure: LF (linear foot) of Striping

For a more detailed Pavement Markings Cost:

Pavement markings will include all markings such as direction arrows, lettering, etc. with reflective paint and all delineator buttons and reflectors required.

Unit of Measure: SF (square foot) of marked area

Sidewalk and Curb & Gutter

Sidewalk, Curb, and Curb & Gutter are assumed to be constructed of PCC.

Curb or Curb & Gutter:

Unit of Measure: LF (linear foot) of Curb or Curb & Gutter

Sidewalk:

Unit of Measure: SF (square foot) of Sidewalk

STRUCTURES

General

Structures include all labor, materials and incidental cost for structural earthwork, foundations, and superstructures.

Bridges

Bridges include structural excavation and backfill, piles, abutments, foundations, piers, girders and beams, the bridge deck, and cast in place curbs.

Unit of Measure: SF (square foot) of Bridge Deck

It is useful to consider bridges as either being "relatively straight forward and uncomplicated" or "more complex", with the unit price reflecting this assessment. Unique or extremely complex bridges should be examined more closely and unit prices adjusted accordingly.

Retaining Walls

Retaining walls include structural earthwork, piling, footing and stem wall.

Unit of Measure: LF (linear foot) of Retaining Wall

Costs for retaining walls will vary greatly, depending on height. If the project will have multiple or very long walls, you should use different unit costs for sections with significantly different heights. The guide suggest unit prices for Retaining Walls in increments of 5 ft and 10 ft, up to a wall height of 30 ft.

Sound Walls

Sound Walls include structural earthwork, piling, concrete base, and reinforced masonry wall, pre-cast or cast in place concrete wall.

Unit of Measure: LF (linear foot) of Sound Wall

A unit price should be selected that reflects the height of wall that is likely to be used. For conceptual purposes, a typical sound wall could be assumed to be a 16 ft high, 8 in. thick concrete masonry wall, on a 1 ft-8 in. high concrete base, with 16" drilled piers, at 16 ft center to center.

MISCELLANEOUS ITEMS

General
Miscellaneous items include all labor, materials, and incidental costs for supply and installation.

Fencing
Fencing includes all posts, rails, chain link fabric, and hardware as required.

Unit of Measure: LF (linear foot) of fence

Unit prices will vary, depending on fence height, whether there is barbed wire on the top, and the size of the project.

Railings and barriers
Railings and barriers include metal beam guardrails and cast in place or pre-cast concrete barriers. All posts, brackets and hardware are included.

Unit of Measure: LF (linear foot) of Railing or Barrier

Traffic Signals
Traffic signals include, but are not limited to, signals, supports, controllers, and power supply.

Unit of Measure: INT (intersections)

Costs for Traffic Signals will differ depending on whether for a Partially Modified Existing System, a New, or a Totally Reconstructed Traffic Signal System.

Roadway Lighting
Roadway lighting includes fixtures, posts, cabling and power supply, panels and controls

Unit of Measure: EA (each) individual street lights/electroliers.

The specific street light/electrolier spacing requirements for the individual jurisdiction that will operate the roadway should be utilized to estimate the approximate total number of lights/electroliers required.

Signing

Signing includes all directional and traffic control signs such as Speed Limit, Do Not Enter, Merge, Yield, etc.

Unit of Measure: for off ramps: RMP (ramps)
for on ramps: RMP (ramps)
for additional highway signs: mi (miles) of roadway
for truss signs: EA (each)
for roadside signs: EA (each)

Signing for on-ramps should be based on 8 signs on wood posts associated with the ramps and freeway merge.

Signing for off-ramps should be based on 2 truss signs and 10 signs on wood posts associated with the ramps and located both on and off the freeway.

A good rule of thumb for additional highway signs is to assume 1 additional truss sign and 10 additional signs on wood posts per 5 miles of roadway.

A typical truss sign is a 48 foot cantilever sign with foundations and lighting.

Typical roadside signs either have a single wood post or two wood posts.

Landscaping

Landscaping includes all seeding, planting of shrubs and trees, fertilizing and mulching, except for hydro-seeding as included under erosion control and irrigation. No provision is made for hardscaping in this unit price.

Unit of Measure: SF (square foot) of landscaped area

A typical assumption for freeway / expressway locations is based on 1 shrub or tree per 100 SF, wood chip mulch over the entire area and irrigation. Maintenance period is one year.

For city street and arterials, roadside or median locations, the average level of treatment is significantly denser than typical freeway landscaping. It may also include some hardscape treatments within the total landscaped area.

Construction Storm Water BMP's

Increased legislation concerning handling construction storm water has resulted in the addition of significant construction costs to projects. The guideline costs for this storm water handling provides for the use of construction related Best Management Practices (BMP's) and development of project specific Storm Water Pollution Prevention Plans (SWPPP).

Unit of Measure: LS (lump sum).
Guideline Cost: 3.0% of Total Construction Bid Items for Codes 2,3,4,5, &6.

Ramp Metering System

Typically all on-ramps to freeways will require the installation of a Ramp Metering System.

Unit of Measure: EA (each) lane of an on-ramp lane installation.

WORK BY OTHERS

General
Work by others shall include all labor, materials and incidental items furnished by companies or agencies other than the construction contractor. Typical items included here are utility construction or relocations provided by a Utility company, force account work by a railroad company, and materials furnished by others (i.e. owner). For State Highways, Caltrans furnishes various items such as signal controllers, Resident Engineer's Office, COZEEP (additional CHP patrols and enforcement in construction zones), monument disks, padlocks, route shields for funding signs, and sign panels.

Units of Measure: LS (lump sum).

ENGINEERING AND MANAGEMENT

General
The costs for engineering and management have been broken down into the following categories:

Engineering Studies
Engineering studies includes all costs associated with conceptual engineering activities. This may include alternative configuration studies, site investigations, information gathering, and other engineering studies and reports as needed, except as included with Environmental Studies.

The guideline cost is 3% of estimated Total Construction Cost.

The stated 3% general allowance should be reviewed for appropriateness for each individual project, as project complexity and size can have dramatic effect on this cost.

Environmental Studies

Environmental studies shall include all costs of studies and reports as required to obtain an environmental permit. All consulting fees, regulatory requirements and cost shall be included.

The guideline cost is 3% of estimated Total Construction Cost.

The stated 3% general allowance should be reviewed for appropriateness for each individual project, especially for smaller projects. Certain types of environmental studies have a minimum cost, regardless of the construction value of the project, so their potential cost impact can easily be under estimated for smaller projects.

Design Engineering

Design Engineering shall include all engineering costs from preliminary engineering to final construction drawings, including right of way engineering. All consulting fees, fieldwork necessary for design, and coordination costs with regulatory agencies and authorities shall be included. The extent of approval requirements associated with Caltrans makes it appropriate to have a varying allowance for Design Engineering depending on the degree of Caltrans involvement.

Caltrans Involvement	Design Engineering Allowance
Category 1: Having No Direct Caltrans Involvement	12% of Total Construction Cost
Category 2: Requiring a Caltrans Encroachment Permit	13% of Total Construction Cost
Category 3: Having Direct Caltrans Involvement and Approval	14% of Total Construction Cost

The Guide is set to automatically calculate Design Engineering Costs at 13%. To use another percentage rate, enter the new rate in the Proponent Price Column.

Design Services During Construction

Construction Engineering includes all design services during construction (i.e. review of shop drawings and contractor submittals, responding to Requests for Clarifications, and the preparation of construction Record Drawings).

The guideline cost is 1.5% of estimated Total Construction Cost.

Construction Staking
Construction Staking includes all staking costs for the location of the proposed structure.

The guideline cost is 2.5% of estimated Total Construction Cost.

Construction Management
Construction Management includes all supervision, inspection, administrative support and materials testing necessary to ensure the work is being constructed to the appropriate standards.

The guideline cost is 13% of estimated Total Construction Cost.

LAND AND RIGHT-OF-WAY

General
Land and right-of-way shall include all costs associated with purchase of land, easements and right-of-way such as purchase price, cost of relocating current businesses or residences, right-of-way engineering, and acquisition services.

Land Costs
Land costs are to include the purchase price of land, easements and right-of-way.

Unit of Measure: LS (lump sum).*

Relocation Costs
Relocation costs shall include all costs associated with the relocation of a current tenant and may include locating a suitable replacement property, interest payments during a construction of the replacement property as well as all costs associated with relocating all movable property to the replacement property.

Unit of Measure: LS (lump sum).*

** backup information should be provided.*

Acquisition Services

Acquisition services include the costs of all services necessary to bring the purchase of land, easements and right of way to a satisfactory conclusion. This includes legal services, title searches, appraisal preparation, negotiations with current owners, financial and real estate consultants, etc.

Unit of Measure: LS (lump sum).*

Right-of-Way Engineering

Right-of-way engineering includes developing plans for land requirements, reapportionment of assessment districts, surveying, documenting the land and easement limits. For Caltrans facilities, services include preparation of right of way appraisal maps and record of surveys.

Unit of Measure: LS (lump sum).*

Utility Relocation Costs

Include all utility relocation costs, excluding any costs for maintenance of utilities, which are included under advance work.

Unit of Measure: LS (lump sum).

** backup information should be provided.*

FORMS

The forms found in this appendix were created in Microsoft Word. Forms are as follows:

Quantity Sheet	Form C-1
Unit Price Estimate	Form C-2
Estimate Review and Sign-Off Sheet	Form C-3

FORM C-1
QUANTITY SHEET

JOB NO. ______________ SUBJECT ______________ REF. NO. ______________

SHEET ______ OF ______

TITLE ______________ DATE ______________

BY ______________

DRG. -R ______________ CHECKED BY ______________

	DESCRIPTION	NO. PCS	LENGTH	WIDTH	HEIGHT OR WEIGHT	QUANTITY			TOTAL QUANTITY		

FORM C-2
UNIT PRICE ESTIMATE

TITLE ____________________ JOB NO. ____________________

SUBJECT ____________________ DATE ____________________

LOCATION ____________________ BY ____________________

CLIENT ____________________ SHEET ________ OF ________

CHECKED BY ____________________

CODE	DESCRIPTION	QUANTITY	UNIT COST	AMOUNT	TOTAL

FORM C-3
MEASURE C/ J
ESTIMATE REVIEW AND SIGN OFF SHEET

PROJECT NAME: _____
ESTIMATE: _____ DATE: _____
PROPONENT: _____ ESTIMATOR: _____
DESIGN CONSULTANT: _____

INCLUDED IN ESTIMATE

	YES	NO
CONTRACT COST	☐	☐
WORK BY OTHERS	☐	☐
LAND AND RIGHT OF WAY	☐	☐
ENGINEERING AND MANAGEMENT	☐	☐
CONTINGENCY	☐	☐
PROJECT RESERVE	☐	☐

ESTIMATE REVIEW

REVIEWER:	_____	_____
POSITION:	_____	_____
TELEPHONE:	_____	_____
	X	X
SCOPE PROPERLY COVERED	☐	☐
QUANTITIES REASONABLE	☐	☐
PRICING DEVIATIONS EXPLAINED	☐	☐
INDIRECTS REASONABLE	☐	☐
MAJOR ITEMS REASONABLE	☐	☐