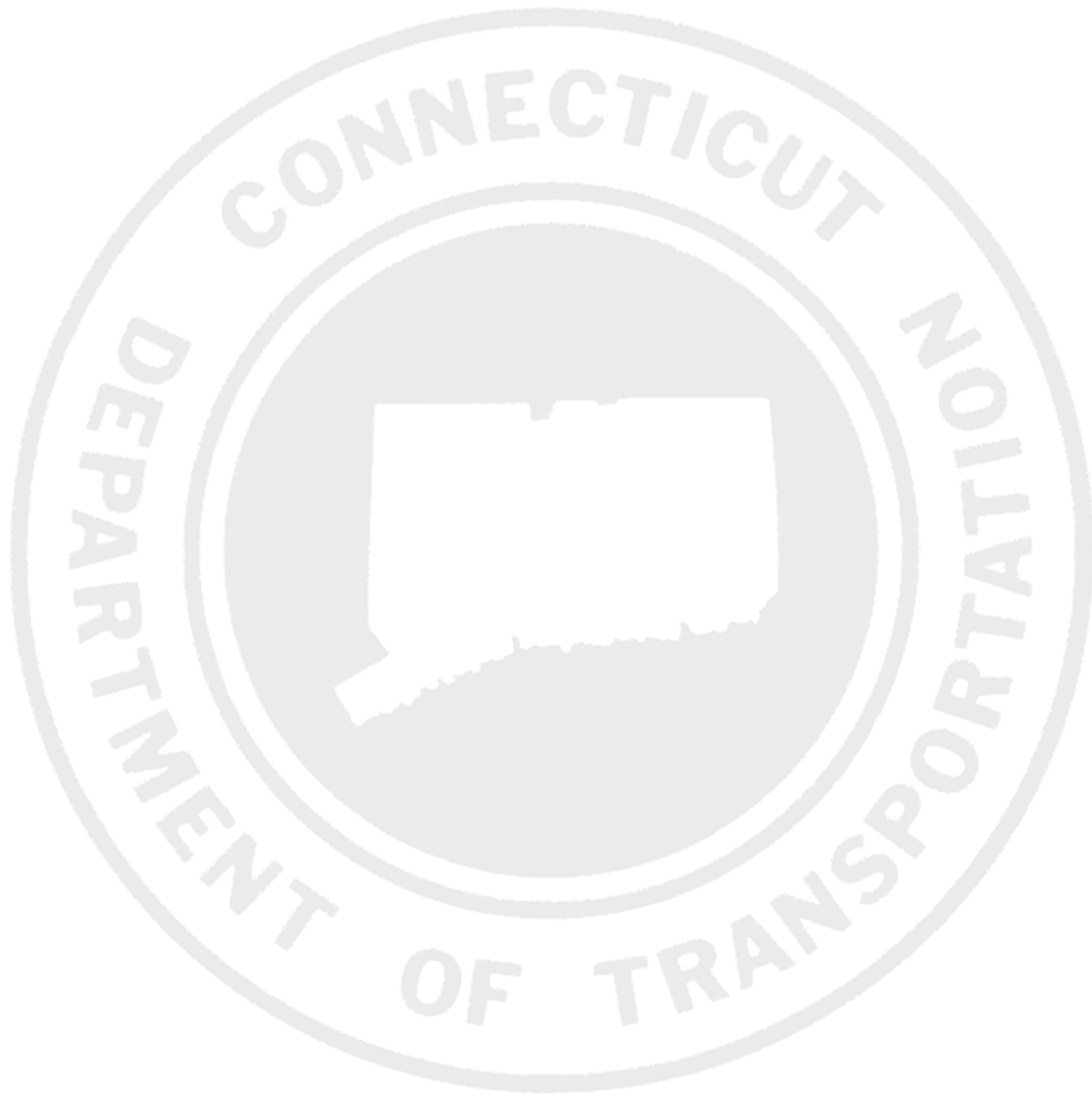


**Connecticut Department of Transportation
2021 Estimating Guidelines**



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Connecticut Department of Transportation 2021 Estimating Guidelines

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Section 1 Introduction

The purpose of these guidelines is to provide direction for developing, documenting, submitting and updating cost estimates. The Department's capital projects typically consist of three phases, each of which have federally obligated funds associated them:

1. Preliminary Engineering (PE)
2. Rights of Way (ROW)
3. Construction (CN)

Cost estimates include Total Project Cost which consist of pre-construction, construction and rights of way phase expenditures.

This document outlines how all of these phases of the project are to be estimated by the designer. In addition, this document outlines the estimating and monitoring requirements during each project milestone. The PE phase estimate consists of three separate estimates:

1. Preliminary Engineering (PE) costs during the PE phase of the project. These costs include such items as design costs (man hours) and survey costs
2. Rights of Way (ROW) – preliminary estimate of the ROW acquisition and administrative costs
3. Construction (CN) – preliminary estimate of construction costs

These guidelines also outline the procedures for meeting the criteria defined in the directive [Project Cost Estimates \(ED-2019-5\)](#). These procedures include standardization of cost estimate submittal, the required submittal of estimates at various milestones, the archiving of estimates, and the periodic review of cost estimates to ensure that they are meeting State and Federal guidelines.

This document also fulfills the requirements of documenting the cost estimating process of the various project phases as required by Federal regulation [23CFR630.106\(a\)\(3\)](#):

- Per 23CFR630.106(a)(3): The State's request that Federal funds be obligated shall be supported by a documented cost estimate that is based on the State's best estimate of costs.
- Per 23CFR630.106(a)(4): The State shall maintain a process to adjust project cost estimates. For example, the process would require a review of the project cost estimate when the bid is approved, a project phase is completed, a design change is approved, etc.

All submitted cost estimates shall use the latest Standard Estimation Template.xlsx which can be found on [COST ESTIMATING](#) webpage.

A. Release of Engineer's Cost Estimates

The following is the policy of the Department regarding the disclosure of the engineer's cost estimate and all documentation related to the creation and calculation of such an estimate for projects advertised for construction:

1. In no case is the detailed item-by-item cost estimate or the supporting or preliminary documentation relating to such an estimate to be released to the public.

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2. The engineer's estimate of the total construction cost for an advertised project is not to be released to the public until the project and all proceedings and transactions concerning that project, including any claims proceedings, settlements, or other litigation related to the project, have been terminated or otherwise concluded.

Section 2 Project Modifications

Adjustments to the project estimates should be submitted by the project manager:

1. When the estimated Federal share of project costs has decreased by \$250,000 or more
2. After any significant scope or cost changes for the project.
3. As outlined in the [Project Modifications and Contingency Management \(CD-2017-6\)](#) .
(CN phase of the project)
4. Project modifications shall be completed within 90 days

Section 3 Estimate Development during Design

This section describes the estimating requirements during design for each of the project phases. The project engineer shall regularly monitor and update the Preliminary Engineering, Rights of Way, and Construction phase estimates as outlined in this section. The following flowchart shows the project timeline and various milestones.

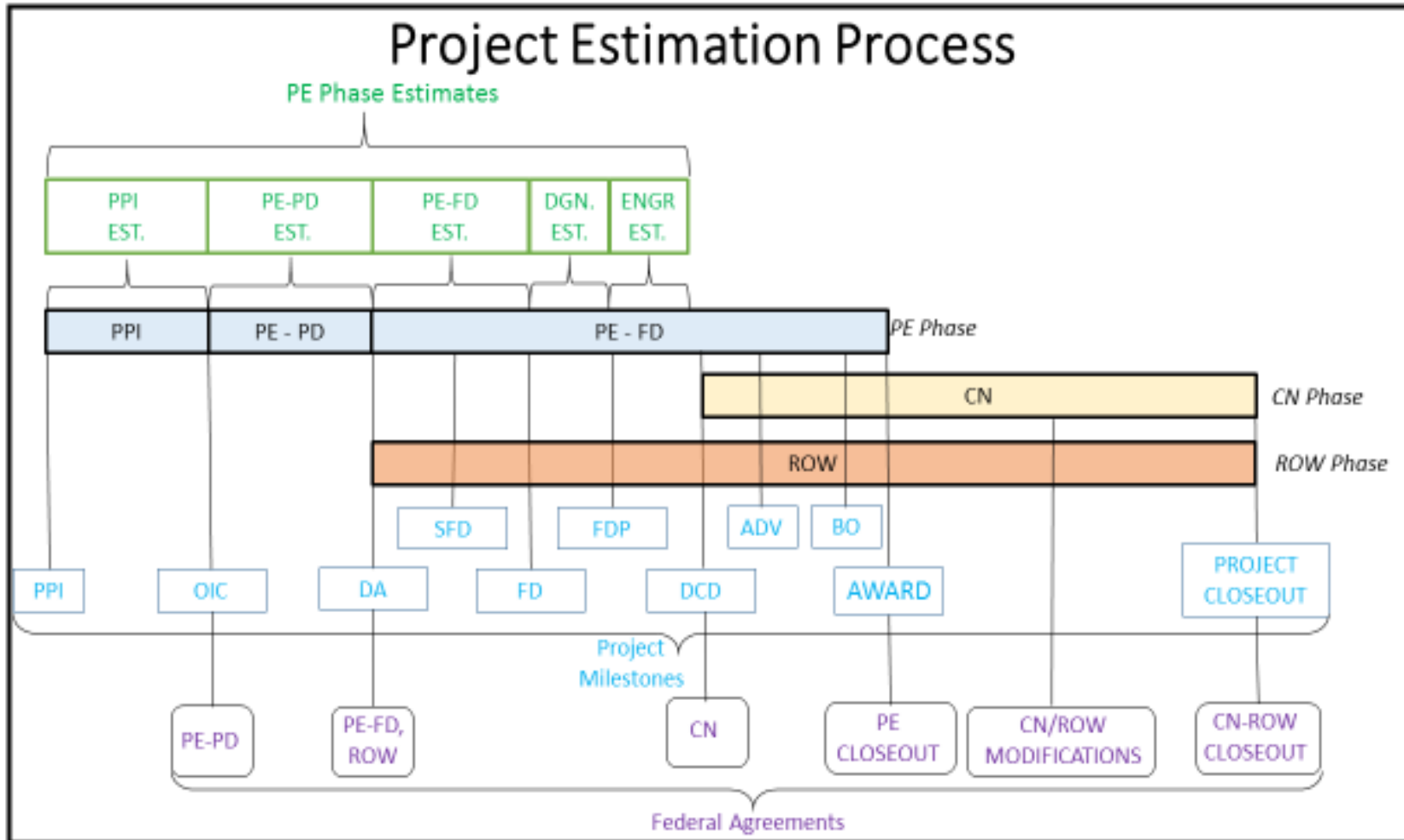


Figure 1. Process Flowchart

Project Financial Phases	PE: Preliminary Engineering
	CN: Construction
	ROW: Rights of Way
Preliminary Engineering Phases/Estimates	PPI: Proposed Project Information
	PE - PD: Preliminary Engineering - Preliminary Design
	PE - FD: Preliminary Engineering - Final Design
	DESIGN: Designers Estimate
	ENGR: Engineers Estimate
PE Project Milestones	PPI: Proposed Project Information
	OIC: Open In CORE (Federal funds are available)
	DA: Design Approval
	SFD: Semi Final Design
	FD: Final Design
	FDP: Final Design Plans
	DCD: Design Completion Date
	ADV: Advertisement
	BO: Bid Opening
	AWARD
	PROJECT CLOSEOUT
Federal Agreements	PE-PD: Federal funds are obligated for PE-PD phase
	PE-FD: Federal funds are obligated for PE-FD and ROW phases
	CN: Federal funds are obligated for CN phase
	PE CLOSEOUT: Funds are closed out for PE phase
	CN/ROW MODIFICATIONS: CN, ROW funds are modified if needed
	CN-ROW CLOSEOUT: Funds are closed out for CN-ROW phases

Table 1. Flowchart Acronyms

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The lead designer will develop project cost estimates as outlined in this section.

B. Storage and Attribution of Cost Estimates

All estimates shall be stored according to *Section 4.6 Estimates and Quantity Calculations* of the [Digital Project Development Manual](#).

C. Project Milestones

Described below are the various estimating requirements for each of the project milestones.

i. Proposed Project Information (PPI)

This is when a project is first considered for federal funding. At this milestone there are no federal funds obligated to the project, and project engineering costs are generally charged to overhead.

The estimating elements of the PPI milestone are:

- Consists of PE, ROW and CN phase estimates which are the responsibility of the project engineer
- Bureau of Finance and Administration (F&A) is notified by email of the proposed project estimates.
- Temporary project number is assigned
- Estimates are updated if older than six months.
- Project schedules are developed

ii. Open In CORE (OIC)

When this milestone is reached, federal funds are available for the Preliminary Engineering – Preliminary Design (PE-PD) phase of the project.

The estimating elements of the OIC milestone are:

- PE expenditures are monitored to ensure adequate PE funding. This monitoring is done on a monthly basis at a minimum.
- If a project modification is required for the PE-PD phase of the project, F&A will be notified via email through the Office of Finance, Capital Services Division. The lead designer will provide updated cost estimates via email to F&A.
- Consists of updated ROW and CN phase estimates which are the responsibility of the project engineer.
- Estimates are updated if older than six months.

iii. Design Approval (DA)

Design Approval is when the Preliminary Engineering – Final Design (PE-FD) phase begins. At this point, federal funds are typically obligated for both the PE-FD and ROW phases.

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The estimating elements of the DA milestone are:

- PE expenditures are monitored to ensure adequate PE funding. This monitoring is done on a monthly basis at a minimum.
- Cost estimates are updated for the PE-PD and PE-FD phases
- Consists of an updated ROW phase estimate which is the responsibility of the Division of Rights of Way in coordination with the project engineer.
- Consists of an updated CN phase estimate which is the responsibility of the project engineer.
- Estimates are updated if older than six months.

iv. Semi-Final Design (SFD)

The estimating elements of the SFD milestone are:

- PE expenditures are monitored to ensure adequate PE funding. This monitoring is done on a monthly basis at a minimum.
- An updated ROW estimate will be provided by the Division of Rights of Way as needed.
- Consists of an updated CN phase estimate which is the responsibility of the project engineer.
- Estimates are updated if older than six months.

v. Final Design (FD)

The estimating elements of the FD milestone are:

- PE expenditures are monitored to ensure adequate PE funding. This monitoring is done on a monthly basis at a minimum.
- An updated ROW estimate will be provided by the Division of Rights of Way.
- Consists of an updated CN phase estimate which is the responsibility of the project engineer.
- Estimates are updated if older than six months.

vi. Final Design Plans (FDP)

The estimating elements of the FDP milestone are:

- PE expenditures are monitored to ensure adequate PE funding. This monitoring is done on a monthly basis at a minimum.
- An updated ROW estimate will be provided by the Office of Rights of Way as needed.
- Submittal of the Designers Estimate for the construction phase from the project engineer to Contract Development.
- Estimates are updated if older than six months.

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- The [Digital Project Development Manual](#) and the [Estimator CTDOT Users Guide](#) provide detailed information related to the submission of FDP estimates.

vii. Design Completion Plans (DCD)

The estimating elements of the DCD milestone are:

- The Cost Estimating unit develops the Engineers Estimate for the construction phase of the project, utilizing the Designers Estimates and current bid histories, ensuring that all quantities and costs are correct. The confidential estimate is provided to F&A by Contract Development via the Cost Data Memorandum.
- F&A utilizes this confidential estimate to enter into a federal aid agreement for the construction phase.
- PE payroll charges are inactivated at DCD.

viii. Advertisement (ADV)

During this milestone, the project is advertised. The estimate may be updated as a result of addendums, if necessary.

ix. Bid Opening (BO)

The Bid Opening typically occurs four weeks after Advertisement. A Bid Analysis of the prices submitted by the three lowest bidders is performed by the Cost Estimating unit. If required, a low bid modification is done and the federal aid agreement is revised. F&A is notified of the low bid via email through the Office of Finance, Capital Services Division by the Office of Contract Administration

x. Award

The project is awarded to the lowest bidder.

xi. Project Closeout (PE Phase)

The closeout is handled by the Division of Financial Management and Support, Project Fiscal Management section. Refer to the section's closeout procedures for detailed information.

Section 4 Construction Phase Estimating During Design

A. General

The Department's cost estimating process is heavily reliant on "AASHTOWare Project Estimator" (Estimator®) a widely-used software adapted specifically for Department use. The Estimator CTDOT Users Guide provides detailed guidance on using the software for Department projects and should be referenced in conjunction with these guidelines.

B. Construction Phase Estimates

- Contract items
- Non-contract
 - Construction inspection and contract administration (materials testing, design support),
 - Work and inspection by utilities and municipalities,
 - Work by state forces (e.g., adjustment of traffic signals by state forces),
 - Work and inspection by railroads, and
 - State Police.
- Contingency (generally added separately to Contract and Non-contract costs)

C. Contract Items

Contract items are the individual "pay items" performed by the Department's contractor. During the bidding process, bidders submit prices for unit-based (i.e., paid for by cubic yard, each, ton, linear foot, etc.) and lump sum items. Some contracts also include one or more Estimated amount (EST) items. For the EST items, the Department designates the contract amount, generally because the required work is not sufficiently defined to solicit binding bids. The established amount is included on the bid proposal form and part of each bidder's bid amount. The actual amount paid for an estimated amount item is determined during construction based on actual requirements.

Estimator® is the principal tool used to estimate contract unit-based items. Much of the procedural detail associated with using Estimator® is provided in the [Estimator CTDOT Users Guide](#). Estimator® has several limitations, including:

- It does not generate estimated prices for lump sum or Estimated (EST) items.
- It does not generate estimated non-contract costs (e.g., utilities, state police).
- It does not generate estimated prices for unit-based items unless the item was used in at least two previous construction contracts within the selected catalog.
- If the selected bid history catalog has between 2 and 14 occurrences of the same item, the Estimator® price will be the average of those prices. No project-specific factors are accounted for.
- If the selected bid history catalog includes 15 or more occurrences of the same item, the Estimator® price will be a regression on several factors (quantity, location, letting date, work type). However, other factors affecting bidder prices (e.g., schedule constraints, difficult site conditions) are not accounted for.

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Because of these limitations, the estimator needs to prepare some prices using other information. Additionally, sometimes the estimator should override the price generated by Estimator®.

D. Non-Contract Items

Non-contract items represent Department expenses for work required to complete the project but not included in the contract. Specific elements comprising this category are discussed below.

i. Incidentals

The cost of Construction Engineering (CENG), which consists of the various activities required to administer the construction contract, including inspection, materials testing, construction phase design support and other functions. It includes state and consultant forces, when applicable. For state-awarded construction contracts, this “Incidental Cost” is estimated using a sliding scale percentage of the contract cost as shown in the Incidental Cost Percentage Chart below. Include the estimated amount in the Estimator® file. For contracts awarded by local public agencies, refer to the Chief Engineer’s memorandum dated August 14, 2009 (Attachment 2).

Project Size/Type	Estimated Incidental Cost (as percent of contract cost)
Less than \$1 Million	40
\$1 Million to \$5 Million	25
\$5 Million to \$20 Million	20
\$20 Million to \$50 Million	15
Greater than \$50 Million	15
Resurfacing, Safety Improvements*	30
Traffic, Incident Management	35

*Applies to Resurfacing by contract (RBC) and Pavement Preservation Projects (PPP) if the design estimate is less than \$20 Million. If greater than \$20 Million use lower rates as applicable to the other project ranges

Table 2. Incidental Cost Percentage Chart

ii. Utility Agreements and Railroad Relocation and Protection

The cost to the Department by public utilities and railroads required by the project, such as for relocation of public utilities or interference with railroads (by physical alteration or occupation of

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their property). During project development, written agreements between the Department and each affected utility and railroad are developed and executed to cover the estimated cost of relocation and protection. The Department’s share of the cost is governed by State statutes. The reimbursement will be based on the overall purpose of the project, the location of the improvement, funding allocation and the ownership of the affected facilities (privately, publicly or cooperatively owned). The Utility Reimbursement Eligibility Chart below will be utilized to determine the eligibility for reimbursement.

Utility Type	State Highway improvement (Non-Limited Access)	State Highway Improvement (Limited Access Highway)	Town Road/Facilities Improvement
*Private Utilities	50%	100%	0%
Public/Municipal Utilities	Cost of Apportionment	100%	Cost of Apportionment
Cooperatively owned Utilities (e.g. MDC)	100%	100%	100%
<i>*The electric transmission facility located within the highway right of way is not eligible for reimbursement.</i>			

Table 3. Utility Reimbursement Eligibility Chart (State’s Share)

The Utilities Section of the Division of Facilities and Transit will, upon request, prepare estimated utility costs during project development; that unit also coordinates preparation and execution of utility agreements. Beginning with the Preliminary Design (or Rehabilitation Study Report) submission, the lead design unit should request an estimate of the State’s share of utility relocation costs, in addition to comments, from the Utilities Section at milestone submissions. The estimated State share of utility relocations should be included in the total estimated construction cost. At FDP, this amount is included in the Estimator® file as a non-contract cost.

iii. State Police

Dedicated State Police patrol and traffic control are used for selected projects, primarily involving work on limited access highways and ramps. The Division of Traffic Engineering (for State – designed projects) or consultant (for consultant designs), in consultation with District Construction, determines which projects require dedicated State Police. When its need is anticipated, the lead design unit should include this item in the cost estimate. For projects designed by the Department in-house staff, the Division of Traffic Engineering will, upon request, provide an estimated State Police cost. For consultant designed projects, the consultant should make an estimate; the Division of Traffic Engineering and District Construction will comment on the estimate as part of design milestone reviews. The cost of State Police is attributable to the project but is not a contract item or cost. The cost is paid by the Department through an interagency Memorandum of Understanding. The estimated amount should be included in the total estimated construction cost. At FDP, this amount is included in the Estimator® file as a non-contract cost.

Estimator® (software) provides no assistance in estimating the three cost categories noted above. The estimated costs for these items should be developed ‘offline’ and entered into Estimator®

iv. Contingency

Contingency is an element of estimated cost included to account for risk and uncertainty. It is usually estimated as a percentage of anticipated costs. Uncertainty and risk diminish as development progresses toward design completion, so contingency also decreases as design development advances. Contingencies are applicable to both contract and non-contract costs. However, these guidelines only provide specific guidance on establishing contingency values for contract costs. See the next section “Cost Estimates during Project Development” for specific guidance.

E. Progression of the CN Estimate through the PE Phase

The various elements of the estimated contract cost are shown in the figure below. The **base estimate** is composed of what can be reasonably ‘known’ about the cost of construction when the estimate is prepared. This base estimate includes the cost of individual work items that have been identified, at current/recent prices. Additionally, in early phases of development, a **minor item allowance** is included to account for items that are known to be needed but are too small to identify and estimate individually. The minor item allowance is part of the base estimate. As previously noted, **contingency** is the cost associated with risk and uncertainty. A contingency amount is computed and included in the estimate to cover the probable cost of work that cannot be reasonably known – but may well be needed.

Construction cost estimates are intended to represent Department disbursements (amounts paid out) to construct a project. As labor and material costs change over time, the cost of construction also changes. All estimates should identify a corresponding reference time (month and year). For fiscal management and capital planning purposes, anticipated disbursements (dollars paid out) should be shown in the “year of expenditure.” **Inflation** refers to the general trend of increasing cost with time. An adjustment is generally needed to account for inflation between the cost computed using current/recent prices and future (i.e., year of expenditure) disbursements.

The various elements of a construction contract cost estimate in relation to major project development milestones are shown in Figure 1. The minor item allowance, contingency and inflation adjustment decrease as project definition is completed, all payment items are identified, and costs reflect current prices. Further guidance on estimating individual elements of the construction contract cost follows.

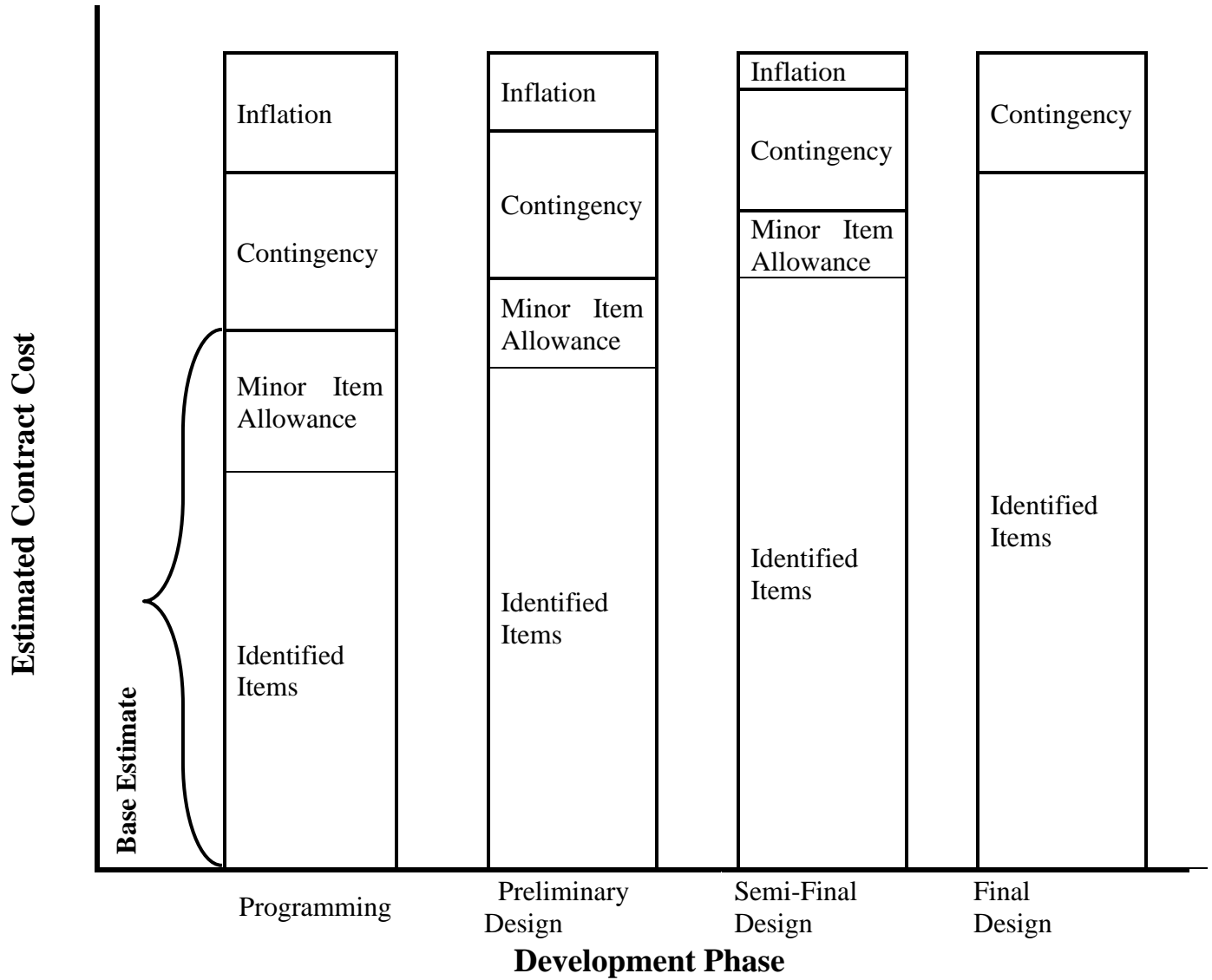


Figure 2. Components of Construction Contract Cost by Development Phase

The **base estimate** is the estimated cost of anticipated contract work, as contemplated at the time of the estimate and in the current price environment. The estimator may use individual “catalog pay items” found in the Department’s bid history (available through Estimator®), aggregate cost factors (e.g., cost/unit of area) or other methods (e.g., cost basis). Aggregate cost factors are discussed in a subsequent section. Additionally, a **minor item allowance** should be included using the factors indicated in Table 1. The estimator uses judgement to select a value from within the noted range. The selected percent value is multiplied by the cost of identified items as noted in the table. No minor item allowance is included in the final estimate since all work should be covered by individual catalog items and quantities. Lump sum items should be considered “Identified Items”.

F. Minor Item and Contingency Factor Guidance

Phase	Minor Item Allowance		Contingency	
	Factor (%)	Multiply by	Factor (%)	Multiply by
Programming	15 - 30	Roadway & Structure items	20 - 30	Base
Preliminary Design	10 - 20	Roadway, Structure, Environmental Compliance & Traffic items	15 - 25	Base
Semi-Final Design	5 - 10	All identified items	10 - 20	Base
Final Design	0	Not applicable	10	Base

Note: Lump sum items should be treated as identified items and are not to be included in Minor Item Allowances when preparing preliminary cost estimates.

Table 4. Minor item and contingency factor guidance.

The **contingency** element of contract cost is computed by applying the selected contingency percentage to the base estimate (identified items plus minor item allowance). Table 1 indicates a range of recommended contingency factors. The ranges shown are associated with project complexity. The lower end of the range is appropriate for low-complexity projects and vice versa. Typical risk factors include uncertain scope, subsurface work, and mitigation measures. At final design, a contingency factor of 10 percent is used in accordance with a Chief Engineer’s memorandum (January 10, 2014), and included in the Estimator® file.

G. Inflation

Estimates are usually based on recent bid prices. Unless inflation is rampant (more than 10 percent annually), prices based on the most-recent three years are generally adequate for contracts with an imminent letting (i.e., bid opening). However, when the letting is more than a year from when the estimate is prepared, an **inflation** adjustment should be included.

There are basically two methods that can be used to adjust cost based on timing. One is through Estimator®. This software is most useful when all of the contract items and quantities are defined. When this information and the scheduled letting date are available and entered in Estimator®, the estimated costs generated by Estimator® will automatically factor time into estimated cost (i.e., account for inflation). Estimator® computes price trends for individual items and projects costs up to the specified “base date.” This adjustment is made automatically only for the unit-based items estimated by Estimator®. This approach is generally *not* workable for preliminary estimates.

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The second method, and the one recommended for preliminary estimates, is to adjust for **inflation** by direct calculation. Except for contracts with durations of three years or more, the inflation adjustment factor is computed by determining the number of years between the estimate date (when estimate is prepared) and scheduled bid opening and multiplying this number by the annual inflation factor. For contracts with durations of three years or longer, compute the number of years from the estimate date to the mid-point of construction. **An annual inflation rate of 3.5 percent per year** (simple, not compound) should be used for 2019 and subsequent years. Example computations follow.

Inflation Example 1 (construction duration less than 3 years)

Estimate date: January 15, 2017

Scheduled bid opening (letting) date: November 16, 2018

Duration of construction contract: 2 years (midpoint: April 2020)

Estimated cost: \$1,500,000

Inflation: 3.5 percent

Estimated future/inflated cost = \$1,500,000 x (1.0 + 1.83x0.035) = **\$1,596,075**

Inflation Example 2 (construction duration more than 3 years)

Estimate date: January 15, 2017

Scheduled bid opening (letting) date: December 14, 2018

Duration of construction contract: 4 years (midpoint: April 2021)

Estimated cost: \$15,000,000

Inflation: 3.5 percent

Estimated future/inflated cost = \$15,000,000 x (1.0 + 4.25x0.035) = **\$17,231,250**

It should also be noted that inflation affects various project cost categories (e.g., rights of way, construction) differently since they are incurred at different points in time and have unique cost trends. The guidance and examples in this section apply only to construction contracts.

Section 5 Preliminary Cost Estimates of Major Items

This section provides guidance for the preliminary estimation of several common construction features that are comprised of many individual contract items. The cost of these construction features cannot be obtained directly from bid history or Estimator®.

The advantage of using these aggregate average costs is that they capture many individual contract items without preparing a detailed design and computing the specific items and quantities that will be required. However, it should be recognized that costs vary significantly by project. Some costs are far higher than the average and some are significantly less. These average costs are most appropriate for scoping estimates.

A. Bridges

Table 2, and associated notes, provide average costs for various categories of bridge work. Most of the information was developed by the Department's Bridge Management unit.

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Description of Work	Estimating Units	Unit Cost (\$)
Total Replacement of Bridge to New Standards: Deck Area <1600 square feet	square feet of replacement bridge ²	640
Total Replacement of Bridge to New Standards: 1,600 sq ft < Deck Area < 11,000 sq ft	square feet of replacement bridge ²	495
Total Replacement of Bridge to New Standards: Deck Area > 11,000 square feet	square feet of replacement bridge ²	440
Removal of Superstructure (over roadway)	square feet of deck removed ³	50
Removal of Superstructure (over water or rail)	square feet of deck removed ³	70
Replacement of Bridge Superstructure: Deck Area <1600 square feet	square feet of deck area replaced	400
Replacement of Bridge Superstructure: 1,600 sq ft < Deck Area < 11,000 sq ft	square feet of deck area replaced	365
Replacement of Bridge Superstructure: Deck Area > 11,000 square feet	square feet of deck area replaced	265
Rehabilitation of Existing Superstructure	square feet of deck area rehabilitated	150
Replace Bridge Girder(s)	linear feet of girder replaced	1000
Repair or Modify Bridge Substructure	square feet of substructure repair	230
Replace Bridge Deck	square feet of deck area replaced	165
Rehabilitate Bridge Deck	square feet of deck area rehabilitated	160
Replace Bridge Joints	linear feet of joints repaired	230
Repair Bridge Beam Ends	each beam end repaired	5,100
Bridge Touch Up Painting	square feet of area repainted	70
Blast Cleaning and Field Painting of Bridge	square feet of steel area cleaned	30
Replace Bridge Bearings	Each bearing replaced	3,000
Install or Replace Bridge Bit Wearing Surface and Waterproof Membrane	square feet of deck area	10
Repair/Rehabilitate Culvert	square feet of culvert area ⁴	170
Replace Culvert	square feet of culvert area ⁴	330

Notes:

1. On-system means the bridge is on a Federal-aid route, which are all roads except those functionally classified as a local road or rural minor collector (use functional classification maps, not state/municipal ownership). Off-system includes everything that is not “On-system”. The costs are for the replacement bridge only and do *not* include other work such as demolition of existing structures, constructing approaches, retaining walls, traffic control and other general contract items (e.g., mobilization, construction staking).
2. Compute the area by multiplying the out-to-out width times the length of the new/replacement (i.e., not existing) bridge.
3. Use the area of the existing bridge.
4. Compute the area for culverts by multiplying the entire end-to-end (direction of flow) length times the inside dimension width (perpendicular to flow).
5. Use annual inflation rate of 3.5%

Table 5. Estimated cost of common bridge work.

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Replacement Costs for Structurally Deficient Bridges Submittal Criteria

1. Exclude culverts (multiple cell box culverts, long span culverts and multiple pipe installations) from the calculations.
2. The total deck area of the replacement bridge is to be used for all calculations. The length dimension is to be as described for Structure Length (Item 49) and the out-to-out width dimension (Item 52) in the Coding Guide.
3. Bridges that are under staged construction should not be included unless the final stage has been bid and a total unit cost can be obtained.
4. Unit costs shall be based on bridge costs only. A list of specific items to be excluded is provided below. The list is not all-inclusive and care should be taken to ensure that other similar items are also excluded.

Items to be excluded from Unit Cost Submittals:

1. Mobilization
2. Demolition of Existing Bridges
3. Approach Slabs (approach slabs may be included when paid for as bridge item, e.g. on integral abutment bridge).
4. Stream Channel Work, Riprap, Slope Paving
5. Earthwork (exclusive of structural excavation, structural backfill, and earthwork associated with Geosynthetic Reinforced Soil Integrated Bridge Systems)
6. Clearing and Grubbing
7. Retaining Walls not attached to Abutments
8. Guardrail Transitions to Bridges
9. Maintenance and Protection of Traffic
10. Detour Costs
11. Signing and Marking
12. Lighting
13. Electrical Conduits
14. Inlet Frames and Grates
15. Field Office
16. Construction Engineering Items
17. Training
18. Right-of-Way
19. Utility Relocation
20. Contingencies

B. Retaining Walls

The average unit costs are based on lump sum costs for wall divided by the area (length times height, measured from the top of footing to the top of wall). The unit cost is inversely proportional to the wall's area. Table 3 provides the recommended unit cost ranges, based on the size of individual walls.

Area of Wall (square feet)	Unit Cost Range (\$/square feet)
<100	\$325 - \$650
100 - 500	\$160 - \$325
500 - 1,000	\$135 - \$200
> 1,000	\$80 - \$135

Table 6. Recommended unit cost ranges for retaining walls.

C. Roadway Lighting

Expressway: \$65/linear foot
 Ramps: \$50/linear foot
 Individual Highway Pole & Light: \$13,000

D. Signalization

Permanent Signal Systems

State Highway non CTSS intersection	\$320,000/intersection
State Highway CTSS intersection	\$380,000/intersection
Locally owned Signal System	\$450,000/intersection
Flashing Beacon	\$50,000/intersection
Accessible pedestrian signal (APS) and Sidewalk ramp upgrade	\$60,000 - \$90,000/intersection
Minor Modification	\$30,000/intersection
Major Modification	\$80,000/intersection

Temporary Signalization

M&PT Bridge Projects	\$50,000 - \$75,000/location
Existing Signal	\$3,500/intersection
Utility Relocation for Signalization Projects	\$12,000/intersection
Rectangular Rapid Flashing Beacon (RRFB)	\$25,000/crossing location
HAWK	\$90,000/location
Temporary Detection	\$2,500/intersection

LUMP SUM CONTRACT ITEMS

This section provides guidance for several common construction features that are typically bid as lump sum items.

E. Structural Steel

The prices of lump sum structural steel items [e.g., Structural Steel, Structural Steel (Site No. _)] includes both material and its installation. Cost is estimated based on weight, using the values (which include material and cost):

Average: \$3.25/lb.

Above 10,000 lbs. and favorable site conditions: \$3.00/lb.

Below 10,000 lbs. or less-than favorable site conditions: \$3.50 - \$11.00/lb.

F. Recurring Lump Sum Items

The four items addressed in this section are included in many projects. For a specific contract, individual bids for these items often vary widely. Given the variability in bidding strategies along with the requirements for specific projects, average dollar values should not be used for contract estimates. Instead, the cost of these items should be estimated as a percentage of total project cost. Table 4 summarizes recent bid history for single-location highway and bridge construction contracts. These percentages are not necessarily representative of contracts primarily or exclusively for area-wide specialty work (bridge repair, pavement marking, rumble strips, signing, signals), building construction or aviation. When estimating these types of contracts, review previous similar contracts.

Item		Percent of total bid	
Number	Description	Average	Range
0201001	Clearing and Grubbing	2.0	0.5 – 6.0
0971001	Maintenance and Protection of Traffic	3.0	0.5 – 6.0
0975002	Mobilization and Project Closeout	6.5	3.5 – 10.0
0980001	Construction Staking	1.0	0.2 – 3.0

Table 7. Range and average percentage for recurring lump sum item costs.

Accurate estimation of these items is difficult since bidders’ prices often reflect factors not directly related to the work entailed by the item. Consequently, average percentages may be appropriate. However, prices should also consider certain historical trends and practical considerations as discussed below.

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i. Clearing and Grubbing

The estimated cost of Clearing and Grubbing should reflect the extent of the effort. Some project types (e.g., realignment) inherently involve more clearing effort than others (e.g., IMS). Some types of work (bridge rehabilitation) vary widely within the same category. The estimator should select a percentage that is representative of the clearing and grubbing effort, generally within the range shown in Table 4.

ii. Maintenance and Protection of Traffic

Bid prices for Maintenance and Protection of Traffic tend to be high (more than 10 percent of total bid) for multi-location bridge repair contracts (e.g., expansion joint, plug joints, beam end). Traffic signal, pavement preservation, intersection improvement and single-location bridge rehabilitation contracts tend to be on the lower end of the range (2 percent or less of the total bid).

iii. Mobilization and Project Closeout

Bids for Mobilization and Project Closeout (as a percent of total bid) are less volatile than the other recurring lump sum items. Multi-location bridge repair contracts (beam ends, bearings, joints) tend to be higher (10 percent and above). Mobilization for these contracts should be estimated at 10 percent of the total contract and the average value (6.5 percent) is recommended for all other contracts.

iv. Construction Staking

Bids for Construction Staking tend to be fairly logical, generally related to the level of effort. This item is generally 2 percent or more of the total bid for realignment and widening of existing facilities and bridge replacement contracts. For pavement preservation, bridge rehabilitation and traffic signal contracts, this item is generally around 0.5 percent of the contract. For all other contracts, the average (1 percent) is recommended.

Section 6 Other Costs

This section provides guidance on several common miscellaneous cost items.

A. Railroad Protection

i. Flagging:

Metro North, Amtrak and Genesee Wyoming: \$1,600/man/shift (not a contract item)

Other railroads: \$800/man/shift (not a contract item)

ii. De-energizing:

\$2,500/Flagman and groundman/shift (not a contract item)

B. On-site Traffic Control Personnel

i. State Police Officer

\$85/hour (non-contract item)

ii. Town (City) Police Officer

\$75/hour (contract item, Estimated amount)

iii. Uniformed Flagger

\$55/hour (contract item, bid unit price)

For preliminary estimating guidance on other construction costs, consult with relevant functional divisions and units (Traffic Engineering, Utilities, Environmental Compliance).

Section 7 Recent Bid Prices for Common Contract Items

Estimator® is the best source of estimated unit prices. If a unit-based item is included in a sufficient number of recent contracts (3 or 5 years, depending on the selected catalog), the software will develop a unit price as described in the “General” section of these guidelines. Therefore, Estimator® is the generally preferred source of unit costs. However, Attachment 3 is provided as a quick source of ‘ball park’ unit price ranges. The ranges provided reflect expected range, as opposed to the absolute range (minimum and maximum bids) for these items. It is not unusual for a bid to fall outside the ranges shown. Typically, unit prices decline as quantities increase. Factors such as site constraints, schedule and location also affect bid prices and should be considered in estimating unit costs. This information (i.e., Attachment 3) should never be used as the primary basis for developing final estimates.

Table 8. General Price Ranges of Common Items

Item No.	Item Description	Units	Unit Price Range	
101117	CONTROLLED MATERIALS HANDLING	c.y.	\$8.50	\$53.50
202000	EARTH EXCAVATION	c.y.	\$14.00	\$51.00
202100	ROCK EXCAVATION	c.y.	\$55.00	\$170.00
202315	DISPOSAL OF CONTROLLED MATERIALS	ton	\$55.00	\$96.00
202502	REMOVAL OF CONCRETE PAVEMENT	s.y.	\$16.00	\$43.00
202529	CUT BITUMINOUS CONCRETE PAVEMENT	l.f.	\$2.25	\$11.00
203000	STRUCTURE EXCAVATION - EARTH (COMPLETE)	c.y.	\$16.00	\$96.00
203100	STRUCTURE EXCAVATION - ROCK (COMPLETE)	c.y.	\$55.00	\$214.00
204001	COFFERDAM AND DEWATERING	l.f.	\$55.00	\$535.00
205003	TRENCH EXCAVATION 0'-10' DEEP	c.y.	\$11.00	\$53.50
207000	BORROW	c.y.	\$5.50	\$53.50
209001	FORMATION OF SUBGRADE	s.y.	\$1.60	\$15.00
211000	ANTI-TRACKING PAD	s.y.	\$14.00	\$53.50
212000	SUBBASE	c.y.	\$27.00	\$107.00
213100	GRANULAR FILL	c.y.	\$43.00	\$107.00
216000	PERVIOUS STRUCTURE BACKFILL	c.y.	\$38.00	\$85.00
219001	SEDIMENTATION CONTROL SYSTEM	l.f.	\$4.25	\$13.00
304002	PROCESSED AGGREGATE BASE	c.y.	\$38.00	\$85.00
406157	PMA S0.35	ton	\$90.00	\$214.00
406159	PMA S0.5	ton	\$95.00	\$214.00
406170	HMA S1	ton	\$95.00	\$268.00
406171	HMA S0.5	ton	\$90.00	\$290.00
406172	HMA S0.375	ton	\$100.00	\$320.00
406173	HMA S0.25	ton	\$107.00	\$320.00

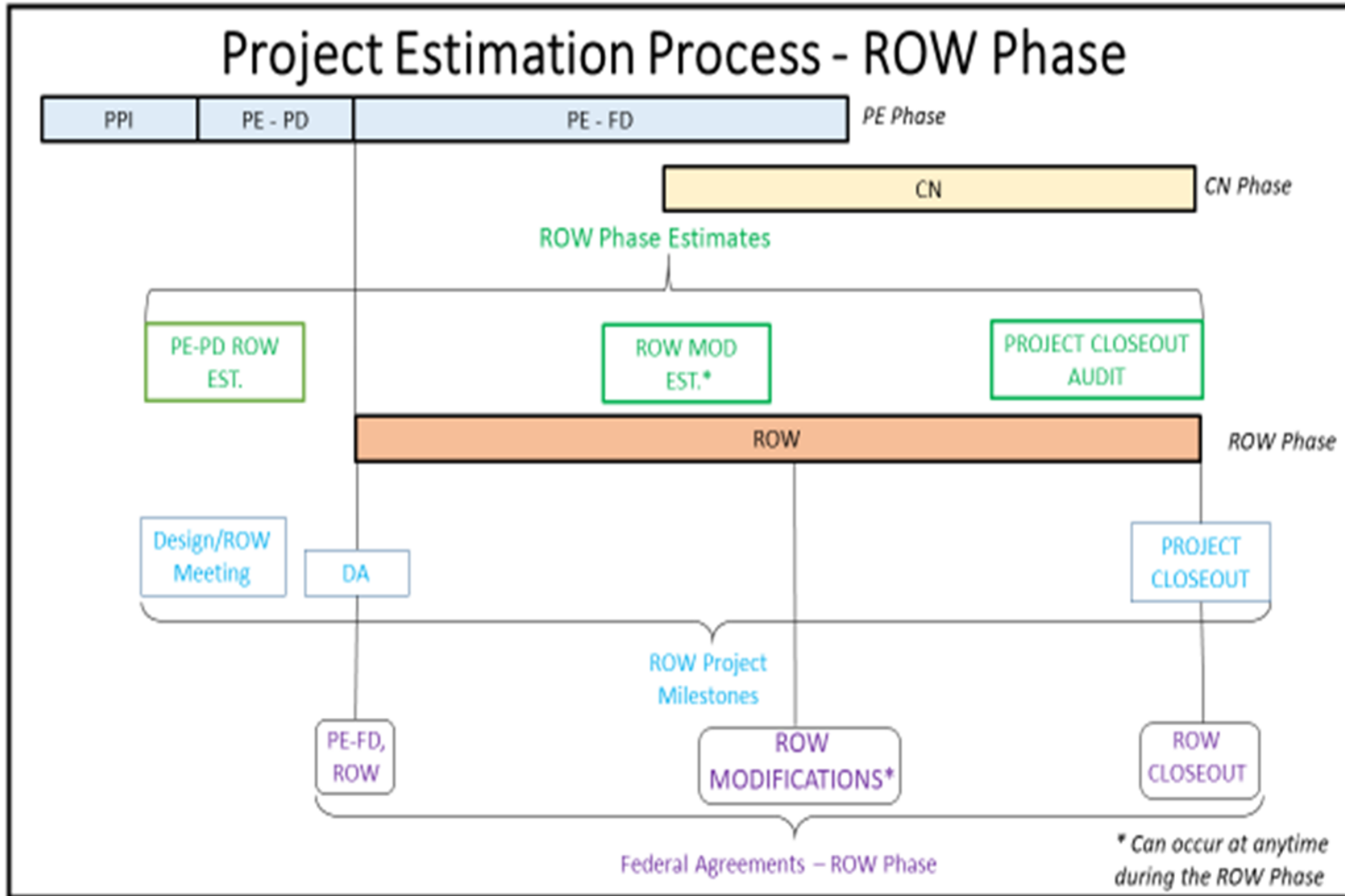
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Item No.	Item Description	Units	Unit Price Range	
406236	MATERIAL FOR TACK COAT	gal.	\$5.50	\$16.00
406267	MILLING OF HMA (0" TO 4")	s.y.	\$4.25	\$19.00
406275	FINE MILLING OF BIT. CONCRETE (0" - 4")	s.y.	\$2.75	\$16.00
507001	TYPE "C" CATCH BASIN	ea.	\$2,550.00	\$5,350.00
507771	RESET CATCH BASIN	ea.	\$640.00	\$1,600.00
520036	ASPHALTIC PLUG EXPANSION JOINT SYSTEM	c.f.	\$270.00	\$428.00
601000	CLASS "A" CONCRETE	c.y.	\$700.00	\$1,300.00
601201	CLASS "F" CONCRETE	c.y.	\$535.00	\$2,675.00
601318	PARTIAL DEPTH PATCH	c.f.	\$140.00	\$428.00
602000	DEFORMED STEEL BARS	lb.	\$1.30	\$2.75
602006	DEFORMED STEEL BARS - EPOXY COATED	lb.	\$1.60	\$3.50
651001	BEDDING MATERIAL	c.y.	\$27.00	\$107.00
651012	15" R.C. PIPE	l.f.	\$48.00	\$96.00
651013	18" R.C. PIPE	l.f.	\$54.00	\$160.00
651015	24" R.C. PIPE	l.f.	\$64.00	\$192.00
651017	30" R.C. PIPE	l.f.	\$85.00	\$214.00
703012	MODIFIED RIPRAP	c.y.	\$64.00	\$160.00
707009	MEMBRANE WATERPROOFING (COLD LIQUID ELASTOMER)	s.y.	\$64.00	\$123.00
714050	TEMPORARY EARTH RETAINING SYSTEM	s.f.	\$21.00	\$64.00
751711	6" UNDERDRAIN	l.f.	\$21.00	\$50.00
751821	6" STRUCTURE UNDERDRAIN	l.f.	\$20.00	\$53.50
811001	CONCRETE CURBING	l.f.	\$27.00	\$53.50
813031	6" GRANITE STONE CURBING	l.f.	\$59.00	\$128.00
815001	BITUMINOUS CONCRETE LIP CURBING	l.f.	\$5.50	\$32.00
822001	TEMPORARY PRECAST CONCRETE BARRIER CURB	l.f.	\$16.00	\$64.00
822002	RELOCATED TEMPORARY PRECAST CONCRETE BARRIER	l.f.	\$5.50	\$16.00
910170	METAL BEAM RAIL (TYPE R-B 350)	l.f.	\$21.00	\$37.00
910173	R-B 350 BRIDGE ATTACHMENT - VERTICAL SHAPE	ea.	\$2,450.00	\$3,650.00
910174	R-B 350 BRIDGE ATTACHMENT - JERSEY SHAPE	ea.	\$2,800.00	\$3,850.00
911924	R-B END ANCHORAGE-TYPE II	ea.	\$12.00	\$1,925.00
912503	REMOVE METAL BEAM RAIL	l.f.	\$4.25	\$13.00
921001	CONCRETE SIDEWALK	s.f.	\$8.50	\$32.00
921005	CONCRETE SIDEWALK RAMP	s.f.	\$13.00	\$35.00
921039	DETECTABLE WARNING STRIP	ea.	\$134.00	\$425.00
922501	BITUMINOUS CONCRETE DRIVEWAY	s.y.	\$39.00	\$85.00
925201	PAVEMENT FOR RAILING	s.y.	\$38.00	\$82.00

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Item No.	Item Description	Units	Unit Price Range	
939001	SWEEPING FOR DUST CONTROL	hr.	\$32.00	\$195.00
944000	FURNISHING AND PLACING TOPSOIL	s.y.	\$5.50	\$16.00
949000	WOOD CHIP MULCH	s.y.	\$7.50	\$18.00
950005	TURF ESTABLISHMENT	s.y.	\$1.30	\$5.50
969060	CONSTRUCTION FIELD OFFICE, SMALL	month	\$2,140.00	\$5,350.00
969062	CONSTRUCTION FIELD OFFICE, MEDIUM	month	\$1,925.00	\$5,500.00
970007	TRAFFICPERSON (UNIFORMED FLAGGER)	hr.	\$32.00	\$75.00
974001	REMOVAL OF EXISTING MASONRY	c.y.	\$100.00	\$1,100.00
976002	BARRICADE WARNING LIGHTS – HIGH INTENSITY	day	\$0.75	\$2.25
978002	TRAFFIC DRUM	ea.	\$32.00	\$107.00
981100	42” TRAFFIC CONE	ea.	\$27.00	\$65.00
1001001	TRENCHING AND BACKFILLING	l.f.	\$21.00	\$53.50
1008115	2" RIGID METAL CONDUIT IN TRENCH	l.f.	\$11.00	\$21.00
1130000	HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARR	day	\$16.00	\$82.00
1131002	REMOTE CONTROL CHANGEABLE MESSAGE SIGN	day	\$32.00	\$107.00
1208931	SIGN FACE - SHEET ALUMINUM (TYPE IX RETROREFLECTIVE SHEETING)	s.f.	\$32.00	\$92.00
12091X4	HOT APPLIED PAINTED PAVEMENT MARKINGS 4” (Y OR W)	l.f.	\$0.16	\$0.40
1210101/2	4” WHITE/YELLOW EPXOY RESIN PAVEMENT MARKINGS	l.f.	\$0.38	\$0.80
1210105	EPXOY RESIN PAVEMENT MARKINGS, SYMBOLS	s.f.	\$3.50	\$5.50
1211001	REMOVAL OF PAVEMENT MARKINGS	s.f.	\$1.10	\$2.25
1220027	CONSTRUCTION SIGNS	s.f.	\$10.00	\$48.00
1802210.XX	TEMPORARY IMPACT ATTENUATION SYS MODULE XXXX LB	ea.	\$215.00	\$535.00

Appendix A Rights Way Estimation Process



A. Project Milestones

i. Design – ROW Meeting

Once project design has progressed far enough that property impacts are identified, Design schedules a Design/Right of Way meeting. At this point the ROW estimate is part of the PE Estimate Phase. The estimating elements of the Design - ROW milestone are:

- Design will provide ROW with:
 - PD Plans
 - Schedule of Property Owners
 - Title Roll Mylar
 - ROW Impact plan
 - Anticipated construction duration
- The ROW cost estimate will consist of ROW expenses including:
 - Property rights to be acquired
 - Relocation costs (when applicable)
 - Demolition costs (when applicable)
 - Overhead costs
- Estimates are updated if older than twelve months.

ii. Design Approval

At Design Approval, federal funds are obligated and the ROW phase of the project formally begins. At this point, ROW will begin title searches and the production of property maps for acquisition purposes

- Estimates are updated if older than six months.

iii. ROW Modifications

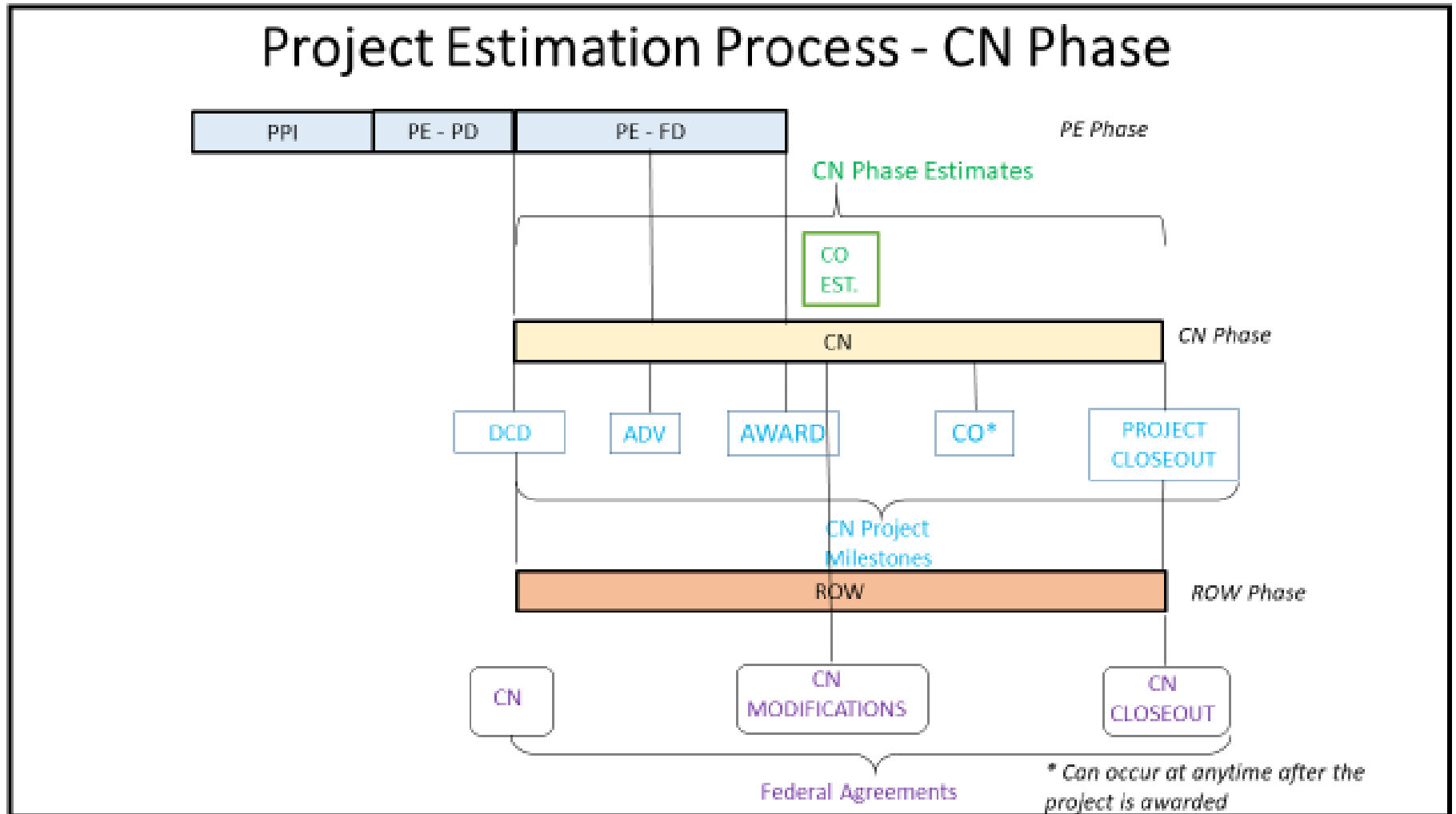
ROW Estimate modifications can take place anytime during the ROW phase of the project. Updated estimates are done when:

- At the request of the Project Manager due to scope changes
- If valuations of properties are significantly higher than initially estimated
- Estimates are updated if older than twelve months.

iv. Project Closeout

At project closeout, ROW will request an audit after the Certificate of Acceptance (CON-501) has been issued.

Appendix B Construction Estimation Process



A. Project Milestones

i. Design Completion Date

- Any updates to the estimate are the design engineer's responsibility between DCD and ADV

ii. Advertisement

- Any updates to the estimate are the design engineer's responsibility between ADV and Award (done through addendums)

iii. Award

- After award through project closeout, an updated estimate for any construction initiated change orders will be the responsibility of the Construction Project Engineer
- After award through project closeout, an updated estimate for any design initiated change orders will be the responsibility of the Design Project Engineer

iv. Project Closeout

- At project closeout, Construction will request an audit after the Certificate of Acceptance (CON-501) has been issued.

Appendix C Revisions

DATE	REVISION	Page No.
06/25/2019	Increased "Replace Culvert" cost from \$240 to \$310 SF	16
09/03/2019	Added ROW and CN Phases, Appendix B and C	26-29
11/26/2019	Added Release of Engineer's Cost Estimates	1-2
07/12/2019	Updated costs for: Bridge, Retaining Wall costs, Roadway Lighting, Structural Steel, Railroad Protection, Recent Bid Prices for Common Contract Items	various