



WESTERN FEDERAL LANDS
HIGHWAY DIVISION

Estimating Handbook

December 2023

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1. INTRODUCTION

This manual provides guidance for developing estimates at the various milestones, selecting bid items and methods of measurement, rounding, and presenting quantities, and pricing item work.

WFLHD staff and consultants use this manual when pricing work or preparing estimates on Western Federal Lands Highway Division (WFLHD) projects.



2. THE ENGINEER'S ESTIMATE

2.1 Purpose

The Engineer's Estimate is a critical component of the PS&E, as it serves as the basis for probable construction cost; supports decision-making and selection of alternatives; affects and controls the project scope, and serves as a guide to evaluate bidders' proposals.

2.2 Terminology

"*Engineer's Estimate*" and "*Construction Cost Estimate*" are terms that refer to the same work product. The engineer's estimate (or construction cost estimate) represents the total probable cost of the construction project, including direct costs, indirect costs, and profit.

The terms '*engineer's estimate*' and '*construction cost estimate*' are used interchangeably in this document.

2.3 Cost and Price

The terms 'cost' and 'price' are often used interchangeably, but they have different definitions. 'Cost' includes the direct cost (equipment, labor, materials) of the work and indirect costs (overhead). The 'price' of an item or project includes direct and indirect costs, as well as profit.

2.4 Contingencies

A contingency is a lump sum amount included in the Engineer's Estimate with the purpose of addressing risk; it is not a placeholder to account for items that are not quantified or priced. Contingencies represent the cost uncertainties such as: lack of scope definition; lack of information inside the roadway prism (e.g. no survey data available yet, incomplete technical recommendations); uncertainty with respect to right-of-way, environment; and inflation. As project development advances and more information becomes available, unknowns become knowns, the level of accuracy increases, and likewise the contingency decreases. Contingencies are not a means to estimate the value of items that are not individually priced.

2.5 Developing the Engineer's Estimate

The engineer's estimate is initially prepared during the scoping phase or preliminary phase, and then is updated and refined as development of the PS&E progresses.

Regardless of the phase of the project, the engineer's estimate represents the total cost of the construction project. In the earlier phases of a project, major items are individually priced, minor items are grouped, contingencies are included, and incentives are excluded. In the 95% and 100% phases, all items are individually priced, contingencies are removed, and incentives are included.



The PDDM describes the three levels of construction cost estimates – Class C, Class B, and Class A.

2.5.1 Class C Construction Cost Estimate

A Class C construction cost estimate is based on a per mile cost of similar scope construction work and adjusted for inflation and local conditions. It is normally developed for planning, programming, and conceptual studies. The Class C estimate is often used to verify the program amount. Because of the high uncertainty of the estimate at this phase, include a 35 to 50 percent contingency in the Class C construction cost.

2.5.2 Class B Construction Cost Estimate

A Class B construction cost estimate is based on the estimated quantities and unit costs for high-cost categories of work (i.e., the major bid items that will constitute 85% of the total estimate), and either cost per mile or percentage of total construction costs for lower cost categories of work.

Develop the Class B estimate in the preliminary design (15% - 30%) phase and updated at the intermediate design (50%) phase. Include a 20 to 30 percent contingency in the preliminary phase estimate, and a 10 to 20 percent contingency in the intermediate phase estimate.

Miscellaneous minor items may be grouped into categories as a lump sum or percentage of the total construction (include mobilization, construction survey and staking, temporary traffic control, guardrail, signing, striping, erosion, and sediment control, fences, revegetation, landscaping, etc.) based on historical data of similar projects.

While the sophistication of EEBACS gives the impression that all bid items need to be quantified and priced, at the 15%, 30%, or 50% milestone stages, a designer's time is better spent quantifying and pricing the big-ticket items, with minimal effort expended on the low risk, low cost areas.

2.5.3 Class A Construction Cost Estimate

Class A construction cost estimates include all items of work in the contract, individually quantified and priced. Class A estimates also include incentive payments and the partnering cost, which are not bid items but are payments that may be made under the contract. In the Class A estimate, include allowances on bid items that typically have allowances.

Initially develop the Class A construction cost estimate at the plan-in-hand (70%) design phase.

At the 70% phase, the Class A construction cost estimate includes a 10 to 20 percent contingency. At 95% and 100%, all contingencies are removed.



Table 1 summarizes the features of the construction cost estimate for the various design phases.

Table 1. Progression of the Engineer’s Estimate

Design Phase	Class of Estimate	Level of Estimate Detail	Estimating Method	Incentives & Partnering	Contingency
Project Scoping	Class C	LOW Cost per mile	Historical bid-based	NO	35% to 50%
Preliminary Design (15% and 30%)	Class B	MEDIUM High-cost items - individually priced Lower cost items – cost per mile or percent of total	Historical bid-based Cost-based for high-cost items with unique circumstances and specialty items	NO	20% to 30%
Intermediate Design (50%)	Class B	MEDIUM High-cost items - individually priced Lower cost items – cost per mile or percent of total	Historical bid-based Cost-based for high-cost items with unique circumstances and specialty items	NO	10% to 20%
Plan-in-Hand Design (70%)	Class A	HIGH All items are individually priced	Historical bid-based Cost-based for high-cost items with unique circumstances and specialty items	YES	10% to 20%
Final Design (95% and 100%)	Class A	HIGH All items are individually priced	Historical bid-based Cost-based for high-cost items with unique circumstances and specialty items	YES	No Contingency



2.6 Updating the Engineer's Estimate

As mentioned above, update each bid item in the Engineer's Estimate at the 95% milestone. This includes:

- Checking all assumptions to see if they are still valid and still apply.
- Reviewing the source data (historical bid data or quotes and prices used for cost-based estimates) and updating the bid price if quotes/prices have changed since the 70% milestone.

2.7 Validating the Engineer's Estimate after the 95% Milestone

After the 95% milestone has passed, the Designer may be asked by the Project Manager to validate prices of the largest contributors to the overall Engineer's Estimate, especially when any of these conditions are present:

- periods of volatile pricing
- there is a six-month (or more) duration between the last Engineer's Estimate update and when the PS&E will be approved by the Chief of Engineering
- the project hasn't been advertised, and six months has passed since the PS&E package was approved by the Chief of Engineering

An easy way to identify the largest contributors to the overall Engineer's Estimate is to sort the bid items by the extended prices (unit price x quantity), and find the cumulative amount that sums to 80% of the total engineer's estimate.

For validation, it is best to use data that provides a larger sample set (than EEBACS) so that current bidding trends are evident. An example is *OMAN BidTabs*. It is acceptable to use EEBACS for estimating the unit price, but for validation, adjust the price by a percentage comparable to what is observed in the trends.

For validations done before the Chief of Engineering's approval, complete the validation approximately two to three months before delivery of the 100% to the Chief of Engineering for signature. This normally provides ample time to obtain additional funds if necessary.

The Designer is responsible for performing the price validation on all bid items that require validation, regardless of who developed the original bid price, i.e., if Structures provided prices for bridge items, the Designer still does the validation, but Structures took the lead on initial bid price and the update at 95%.



3. ESTIMATING METHODS

3.1 Overview

There are two methods for estimating the price of work – the cost-based method and the historical bid-based estimating method. For the cost-based method, the unit price is calculated by considering the cost of each of the price elements (labor, equipment, materials, and incidentals), plus overhead and profit, as they relate to the work on the specific project. For the historical bid-based method, bid item prices from previously awarded contracts are used to establish the bid price for the current project.

When choosing the estimating method, consider the uniqueness of the work, availability of historical bid data for comparable work, and location of the work.

Chapter 3 provides general guidance on the recommended estimating method for frequently used bid items.

3.2 Deciding Which Method to Use

The first step in deciding whether to use the cost-based or historical bid-based method is defining the scope and nature of the work. Think about what needs to be constructed or performed – how that work will be done, what quantities are involved, where will the work occur, what type of site conditions will be encountered, and how readily available the materials are.

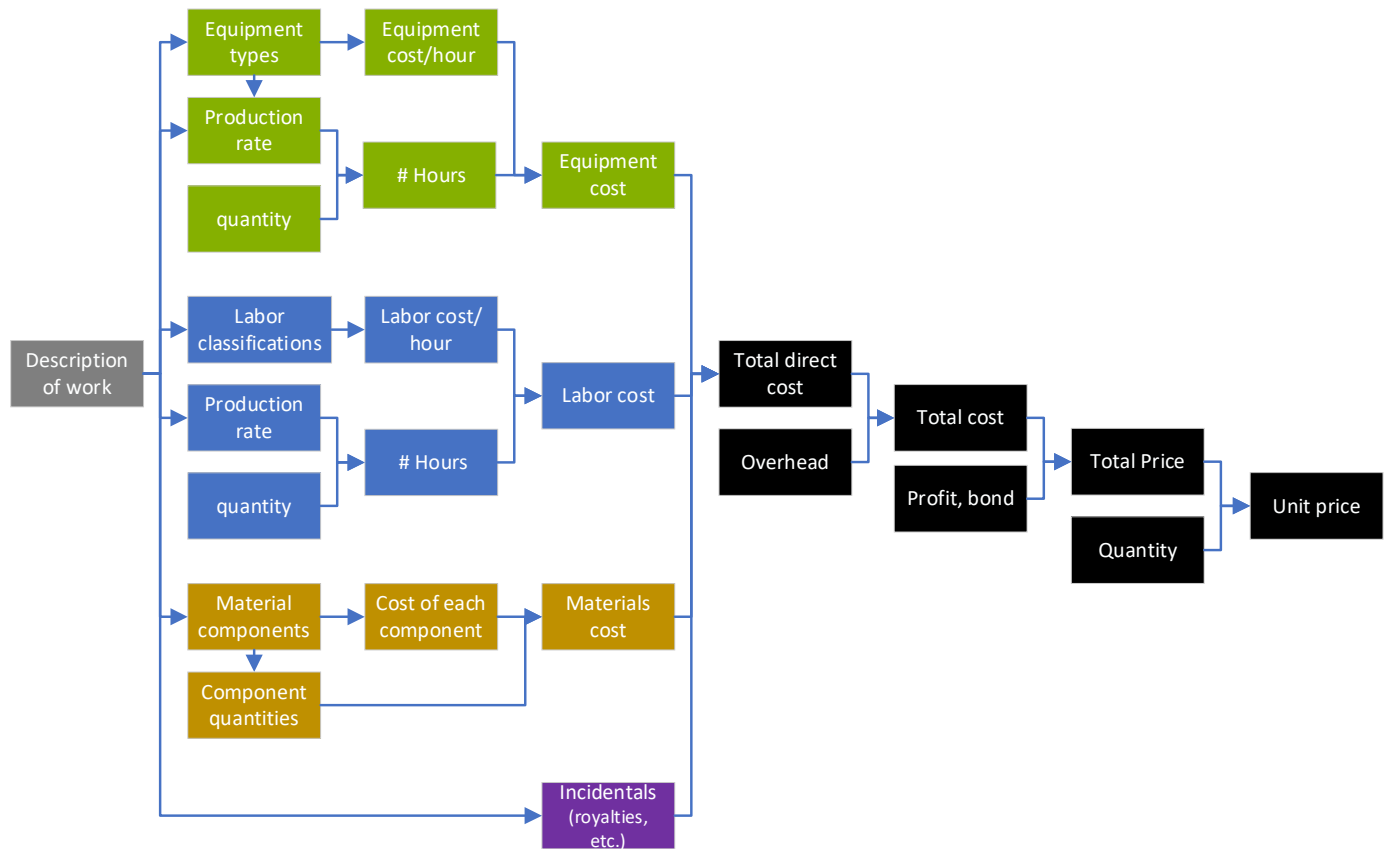
If the work is similar in nature and quantity to a bid item in a recently and competitively bid contract, the historical-bid based method may be used to determine the unit price of the work.

When historical bid-based is not available, or when the work is unique in nature, i.e., detailed construction process, difficult site conditions, long-haul distances, small quantities, expensive materials, specialty labor, remote location, difficult site access, etc., use the cost-based method.



3.3 Cost-Based Estimating

When preparing a cost-based estimate, the labor, equipment, materials, and incidental costs are calculated, and then overhead, profit, and bond are applied. The diagram below shows the data needed and the workflow for preparing a cost-based estimate.



3.3.1 Preparing a Cost-Based Estimate

The development of a cost-based estimate is more detailed than a historic bid-based estimate. The following steps identify the process necessary to develop a reasonable unit price. For an unfamiliar element of work, contact the Highway Design Manager, Construction Operations Engineer, or appropriate CFT member with questions.

A – Define the general scope of the work, the location, and site characteristics.

Identify the quantity of work, the approach to the work, including how the work will be performed, what equipment will be used, the sequence of operations, site conditions, what materials are needed (including quantities), and what type of labor is needed (including equipment operators) to perform the work. Also consider if incidental items, such as permits, are needed.



B – Determine what equipment will be used to perform the work and its cost.

Identify the type and size of equipment that will be used to complete the work. Consider what is reasonable – are there large trees or boulders that need to be moved that might impact the equipment size? Is there a large reach necessary for an excavator? Once the equipment type and size are determined, identify the cost.

To identify the cost, determine the equipment type, the brand name, a model number, and the manufactured year (i.e., Caterpillar front-end loader, 950G, 2006).

There are options for determine pricing for the equipment. Use either the *U.S. Army Corps of Engineer (USACE) Construction Equipment Ownership and Operating Expense Schedule Equipment Rates Manual* (USACE Equipment Rates Manual) or use *RSMMeans*. Both platforms can be found online. When determining pricing, identify both the average hourly rate and the standby hourly rate. The hourly rate is applied when the equipment is in use. The standby hourly rate is applied when the equipment is on site and not in use.

Not all pricing situations require this level of analysis. An excellent alternate source of equipment cost information is the WFLHD construction branch, especially project engineers who are very familiar with equipment capabilities and cost.

C – Determine the hours needed to perform the work the work.

Using production rates, determine the equipment and labor hours associated with the work. Production rates are provided in the CFL production rate spreadsheet located at: <https://highways.dot.gov/federal-lands/design/tools-cfl/production-rates> or contact a WFLHD Project Engineer.

D – Determine labor requirements and costs.

Identify the appropriate labor type necessary for the work being performed. To determine the labor rate, obtain the current Wage Determinations available at <https://sam.gov/content/wage-determinations>. Be sure to add the fringe rate to the base rate to determine the total rate of pay for the labor classification.

E – Determine material requirements, specifications, and costs.

Discuss with the Materials Engineer any information needed for material requirements. Determine the aggregate gradation if necessary, or the class of concrete. For geotechnical materials, geotextiles or subexcavation depths, contact the project's Geotechnical Engineer. For materials requirements for culverts, contact Hydraulics. Obtain any necessary special requirements prior to contacting suppliers for a quote.

It is important to seek out more than one quote, if possible, to ensure price reasonableness.



F – Determine incidental costs.

Incidental costs are costs associated with the work, but not directly calculated in the steps above. Incidental costs might include wetland mitigation fees, permit fees, royalty costs, etc.

G – Calculate the direct cost subtotal.

Add the equipment cost + labor cost + materials cost + incidental costs to arrive at the direct cost subtotal.

H – Calculate the overhead cost.

Assume a rate of 10% for overhead costs. Multiply the direct cost subtotal times 1.10 (using 10% overhead rate) to get the total cost.

I – Calculate profit.

Assume a rate of 10% for profit. Multiply the total cost times 1.10 (using 10% profit rate) to get the price subtotal.

J – Calculate bond.

The contractor's bond cost is based on the total price of the work. Therefore, multiply the price subtotal times 1.005 (0.5% bond rate) total price of the work.

K – Calculate the unit price.

Divide the total price of the work by the number of bid item units to arrive at the unit price of the work.

Example:

The exercise below is for the repair of an existing MSE Wall paid by Lump Sum:

Work includes removal of block facing, excavation of existing material, and replacement of backfill material and existing blocks. Concrete slope and ditch paving will be needed to prevent further erosion.

a. Indicate where the information was derived from.

The information below includes wage rates taken from the Davis-Bacon wage determination and rounded to the nearest dollar, equipment rates from 2019 historical data and rounded to the nearest dollar, and material rates that were quoted by the suppliers.

b. Evaluate the appropriate categories for the components of the item including labor, equipment, materials, and any loading for overhead or profit.

Cost-Based Unit Price

Project Name and Number: **AZ PFH 123-1(1) Example Road**

Pay Item Number: **25205-1000**

Description: **ROCK BUTTRESS, MECHANICALLY-PLACED**

Quantity: **1,500**

Unit: **CUYD**

ASSUMPTIONS		
Description	Assumed Value	Remarks
Production rate	750 CY/day	Remote location. Steep, inaccessible slopes.

EQUIPMENT						
	Description ⁽¹⁾	Quantity ⁽²⁾	Unit	Cost / Hr	Total Equipment Cost	Remarks ⁽⁴⁾
Equipment 1	Cat 330 Excavator	20	hour	\$84.92	\$1,698.40	From RS Means
Equipment 2	End dump, 10 CY	12	hour	\$26.80	\$321.60	From RS Means
Equipment 3	Cat 966 Loader	20	hour	\$31.68	\$633.60	From RS Means
TOTAL					\$2,654.00	

- (1) Show the type of equipment selected, including the size of the equipment.
- (2) Make sure the quantities are appropriate for the production rate selected. (e.g. if you think the work will take 2 days, make sure you don't estimate equipment hours for 6 days). Also make sure the production rate is appropriate for the type and size of equipment (see RS Means or Cat website for equipment production rates)
- (3) These costs/unit can be obtained from U.S. Army Corps of Engineers Equipment Rates from RS Means.
- (4) Note where the information was obtained.

LABOR								
	Description ⁽¹⁾	Quantity	Unit	Cost / Hr ⁽²⁾	Subtotal	Payroll Burden ⁽³⁾	Total Labor Cost	Remarks
Labor 1	Power equipment operator	40	hour	\$31.52	\$1,260.80	35%	\$1,702.08	
Labor 2	Laborers	30	hour	\$19.29	\$578.70	35%	\$781.25	
Labor 3	Truck driver	12	hour	\$24.25	\$291.00	35%	\$392.85	
Labor 4	Foreman	40	hour	\$45.00	\$1,800.00	35%	\$2,430.00	
TOTAL							\$5,307.00	rounded up to nearest dollar

- (1) See RS Means for suggested typical crews for various operations.
- (2) Use Davis-Bacon labor rates (https://beta.sam.gov/search?index=wd&date_filter_index=0&date_rad_selection=date&wdType=dbra&page=1). Include fringes. Not all labor classifications have rates in Davis-Bacon, use judgment where rates aren't available.
- (3) Default payroll burden = 35%



M A T E R I A L S						
	Description	Quantity	Unit	Cost / Unit ⁽¹⁾	Total Materials Cost	Remarks ⁽²⁾
Material 1	Geotextile	396	SY	\$1.20	\$475.20	Quote from White Cap (Denver) on 01/11/21: \$504/roll (500 SY/roll). Delivery fees \$100/roll.
Material 2	Class 4 Riprap	2,300	ton	\$21.00	\$48,300.00	Quote from Big Pit 01/11/21
Material 3	Underdrain	120	LF	\$60.00	\$7,200.00	Used historical bid price
Material 4					\$0.00	
T O T A L					\$55,976.00	rounded up to nearest dollar

(1) These costs/ unit may be obtained from quotes from suppliers. Assume a material quote from a supplier includes the supplier's overhead and profit.

(2) Note where the information was obtained.

Equipment	\$2,654.00
Labor	\$5,307.00
Material	\$55,976.00
Subtotal	\$63,937.00
Overhead (10%)	\$6,393.70
Subtotal	\$70,330.70
Profit (10%)	\$7,033.07
Subtotal	\$77,363.77
Bond (0.6%)	\$464.18
Total	\$77,827.95
Quantity	1500 CY
Calculated Unit Price	\$51.89 per CY
Rounded Unit Price	\$52.00 per CY



3.4 Historical Bid-Based Estimating

Historical bid-based estimating (bid history-based estimating) uses historical bid data from EEBACS or *Oman BidTabs* as a basis for estimating current costs for the same work. Historical bid price data from previously awarded projects are typically stored in databases for three to five years or more; however, use only data from the last one to two years unless there is not sufficient bid data for an item, in which case older data must be used. In such an instance, the estimator may search the bid database across a longer period.

The engineer's estimating software in each Federal Lands Highway Division office provides a listing of unit bid prices on contract items from previous projects. In general, when doing historical bid-based estimating, before using an average of prices, first determine if the high and low prices are out of the ordinary, and if so, remove those from the set of numbers being used to get an average. This ensures the chosen bid price is reasonable and not underestimated. The designer then uses these prices and modifies them to fit the project conditions and adjusts for increases in the overall cost of construction over time using an inflation index. Allow for any factors that may have a direct bearing on the prices, including the following:

- Availability of Construction Material
- Proximity of Access Roads
- Railroads
- Distance from Towns
- Traffic
- Time of Construction
- Inflation
- Quantities

The historical bid price approach, tempered with engineering judgment, is recommended for estimating the minor items of work on a project. The following are usually considered minor items of work:

- Erosion control
- Guardrail
- Landscaping
- Culverts
- Underdrains
- Drop inlets and catch basins
- Manholes
- Curb and gutter
- Sidewalk
- Riprap
- Fencing and cattleguards
- Traffic control
- Signing
- Striping

3.4.1 Adjustments to Historical Bid Information

In historical bid-based estimating, the designer compares the current project with the project(s) from which historical bid information is being pulled and adjusts the price for notable differences between the projects. The following aspects may influence an adjustment: age of the historical bid date, project location, project setting characteristics, and location.



The designer may need to adjust the historical cost factors based on the new project's location, characteristics, and scope.

3.4.1.1 Location

Cost factors are often developed based on statewide averages. In some states, construction costs are different by district or region depending on location. Cost differentials may be due to labor wage changes. Typically, an urban area has higher wage rates than a usual rural area. Other differentials in costs resulting from location can affect both materials and construction equipment (e.g., haul distances). In all cases, the designer must evaluate cost differentials between statewide averages and costs for the actual project location. Thus, designers must make appropriate increase or decrease adjustments as necessary. The designers can look at the GIS data to identify projects in a similar location to theirs.

3.4.1.2 Unique Project Location Characteristics

Consider the project location in relation to such issues as terrain, batch plants, and haul distances. Flat terrain normally improves contractor productivity, so expect lower costs compared to terrain characterized by hills or mountains. If distance influences the transportation of materials, then costs are likely higher than the average. The designer must use judgment to adjust cost factors, so they reflect these types of location characteristics. The designers may need input from construction engineers in developing adjustments for such factors.

3.4.1.3 Scope

Consider differences in the scope of work between the current project and the work bid in the past projects.

3.4.2 Inflating Unit Prices to Current Day Values

Any time an estimate is created or updated; the unit prices must reflect the cost at the time the estimate is done. It may require the estimator to go back to the unit price database and get the latest information.

The estimator must always adjust the unit price for inflation considering the interval of time from when the price was used and the estimating time. Inflate the historical unit bid prices from bid date to current year using the data found on the National Highway Construction Cost Index (NHCCI) at <https://www.fhwa.dot.gov/policy/otps/nhcci/>. This can be done automatically in EEBACS by applying the '2.0 National Hwy CCI' inflation factor.



Example:

When selecting the unit bid prices for “Removal of Sign” on the Maiden Road project, the Designer selected projects in EEBACS that were similar in quantity and location, as shown with highlights below. The locations or quantities that were not similar are not highlighted and were not included in the unit price analysis.

Bid History Unit Price Analysis											Report Date: 06/06/19		
Project No: MT DOT 14203(1)			Schedule(s): A			Milestone: 100%			23 out of 126				
Project Name: Maiden Road			Schedule Type(s): Base			Date Complete: In Progress							
FLMA No:													
Pay Item No.	Pay Item Type	Description	Quantity	Unit	Unit Price Used	Amount							
20301-2400	N	REMOVAL OF SIGN	1	EACH	\$200.00	\$200.00							
Picked: 28		Average: \$192.13		High: \$785.00		Low: \$28.66							
Remarks:													
Bid History Filters: Pay Item Number: 20301-2400 Quantities: ALL Award Dates: ALL States: FP Version: 14 Project Name/Number:						Inflation Index: Schedule Construction Type: Terrain: Density: Using Crosswalk: No							
Award Date	States	Pay Item No. Schedule	Pay Item Description Project	Quantity	Low 1	Low 2	Low 3	Low 4	Low 5	Total Amount	Schedule Construction Type	Terrain	Density
02/15/19	ID	20301-2400	REMOVAL OF SIGN	2	\$120.00	\$124.80	\$110.00	\$108.00	\$900.00	\$2,214,605.60	40901 Asphalt Concrete Construction Agg. Base + <2.5-inches AC Pavement	M	Rural
		A	ID BONVIL 2016(1)										
02/15/19	ID	20301-2400	REMOVAL OF SIGN	2	\$120.00	\$137.28	\$110.00	\$108.00	\$900.00	\$2,104,016.00	40902 Asphalt Concrete Construction Agg. Base + >= 2.5-inches AC Pavement	M	Rural
		B	ID BONVIL 2016(1)										
11/22/17	MT	20301-2400	REMOVAL OF SIGN	7	\$100.00	\$28.66	\$30.00	\$138.00	\$54.00	\$3,544,265.00	40902 Asphalt Concrete Construction Agg. Base + >= 2.5-inches AC Pavement	M	Rural
		A	MT FLATHEAD 917(2)										



Bid History Unit Price Analysis

Report Date: 06/06/19

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Project No: MT DOT 14203(1)

Schedule(s): A

Milestone: 100%

Project Name: Maiden Road

Schedule Type(s): Base

Date Complete: In Progress

FLMA No:

Award Date	States	Pay Item No. Schedule	Pay Item Description Project	Quantity	Low 1	Low 2	Low 3	Low 4	Low 5	Total Amount	Schedule Construction Type	Terrain	Density
05/03/17	OR	20301-2400	REMOVAL OF SIGN A OR PFH 46(13)	5	\$100.00	\$22.20	\$100.00	\$150.00	\$143.00	\$1,816,418.50	55001 Bridge Construction - Concrete	R	Rural
03/30/17	OR	20301-2400	REMOVAL OF SIGN X OR DOT CRGNSA 100(1) & 100(3), OR HOODRIVER 18(1)	3	\$600.00	\$200.00	\$300.00	\$100.00	\$130.00	\$4,699,696.50	55001 Bridge Construction - Concrete	M	Rural
02/03/17	MT	20301-2400	REMOVAL OF SIGN A MT SWEETGRASS 210(1)	5	\$75.00	\$158.00				\$5,542,549.75	55001 Bridge Construction - Concrete		
08/04/16	WA	20301-2400	REMOVAL OF SIGN (INTERPRETIVE SIGN STRUCTURES) A WA DOT 401(1)	3	\$300.00	\$700.00				\$745,108.10	64601 Roadside development	L	Rural
08/04/16	WA	20301-2400	REMOVAL OF SIGN A WA DOT 401(1)	4	\$250.00	\$785.00				\$745,108.10	64601 Roadside development	L	Rural
04/19/19	CA	20301-2400	REMOVAL OF SIGN X CA FTNP SEKI 10(12)	12	\$290.00	\$100.00	\$150.00			\$10,585,021.10	40414 Pulverize + >= 2.5-inches Asphalt Concrete Overlay	M	Rural
04/19/19	CA	20301-2400	REMOVAL OF SIGN A CA FTNP SEKI 10(12)	40	\$290.00	\$100.00	\$150.00			\$11,142,820.70	40414 Pulverize + >= 2.5-inches Asphalt Concrete Overlay	M	Rural
04/16/19	CA	20301-2400	REMOVAL OF SIGN X CA FLAP MER CR337(1)	3	\$124.30	\$100.00	\$57.00	\$146.00	\$50.00	\$556,448.79	40204 Asphalt Concrete Overlay >=2.5-inches	L	Rural



The price from EEBACS may not be the final unit price. Critically evaluate if there is any other work the contractor will be required to complete to get paid for this work. When unsure, check with Highway Design Manager, Construction CFT member, and/or technical services staff. In the example shown above, consider the following:

- Are any signs larger than standard require additional components to be removed?
- Are any of the signs located in such a way that a special piece of equipment will be needed to aid in removal?

3.5 Inflating the Engineer's Estimate from Current Day to Projected Award Date

Engineer's estimates are based upon current unit pricing information. This does not reflect anticipated price increases due to inflation from the date the estimate was created to the projected award date. The designer calculates the overall anticipated inflation using <https://highways.dot.gov/federal-lands/estimates/wfl/inflation-calculator>. Inflation is estimated at 4% annually based upon historic data available from the National Highway Construction Cost Index (NHCCI).

At the 30%, 50%, and 70% milestones apply the projected inflation to the estimate as a design contingency. At the 95% milestone, the project inflation is to be applied manually to every bid item.



4. UNIT PRICE ROUNDING

Since an estimate approximates costs, it is not an exact calculation. If an estimate is shown calculated to the nearest penny, there can be a false impression that the estimate is precise. Therefore, round the unit price to the nearest appropriate significant digit as shown below.

Table 2. Unit Price Rounding

Unit Price Range	Rounding
\$0.01 to \$19.99	\$0.25
\$20.00 to \$99.99	\$1.00
\$100.00 to \$499.99	\$10.00
\$500.00 to \$999.99	\$50.00
\$1,000.00 to \$2,499.99	\$100.00
\$2,500.00 to \$9,999.99	\$500.00
\$10,000.00 to 49,999.99	\$1,000.00
\$50,000.00 or greater	\$5,000.00



5. SELECTING AND PRICING BID ITEMS

5.1 Overview

The objective of this chapter is to provide guidance for selecting the appropriate pay items and pricing bid items for each project.

5.2 Special Considerations

- i. **Quantity** – Generally, the unit price for larger quantities of a given material will be less than for smaller quantities.
- ii. **Location** – Consider the project’s location, whether in an urban or rural setting, in establishing bid prices. A project in an urban setting is generally faced with confined workspaces, greater volumes of traffic, and limited hours of operation. A project in a rural location generally requires materials, equipment and personnel brought in from elsewhere.

5.3 Individual Bid Items

The following sections provide information to help users choose bid items and estimate unit prices for common bid items.



SECTION 151 - MOBILIZATION

<i>Project Type</i>	<i>Typical Pay Item</i>
All Projects	<ul style="list-style-type: none"> • 15101-0000 Mobilization <p>Use <i>LPSM</i> item for all projects. Include mobilization for contract options.</p>

a. Recommended Method of Measurement

- Lump Sum (LPSM)

b. Quantity Allowance & Rounding

- For lump sum items, plan and bid quantities are the same

c. Recommended Method for Estimating Unit Price

- % of total cost

d. Pricing Considerations

- Location of the project – Projects in remote areas will typically have a higher mobilization cost.
- Equipment needed on the project – large and specialty equipment might have a higher mobilization cost.
- Projects with multiple work locations, such as ERFO projects may have higher mobilization cost.
- Multi-season projects with a winter shutdown will typically have a higher mobilization cost.

e. Pricing Guidance

For Mobilization, start with these values, and adjust based on pricing considerations.

- Use 10% - 11% of the total contract amount.
- For projects > \$3,000,000. Round to the nearest \$5,000.
- For projects ≤ \$3,000,000. Round to the nearest \$1,000.
- For DAR projects use 9% of the contract amount. Round to the nearest \$1,000.
- For ERFO projects use 9.5% of the contract amount. Round to the nearest \$1,000 or \$5,000



SECTION 152 – CONSTRUCTION SURVEY AND STAKING

<i>Project Type</i>	<i>Typical Pay Items</i>	<i>Additional Options for Pay Items</i>
Projects with limited scope, such as OMAD, ERFO, and pavement preservation projects	<ul style="list-style-type: none"> For some of these projects, survey and staking is not paid for directly 	<ul style="list-style-type: none"> 15201-0000 Construction Survey and Staking <p>In the SCRs, describe the work included in the LPSM item.</p>
3R - Pavement Only	<ul style="list-style-type: none"> 15210-3000 Centerline, Verification and Staking 15215-3000 Survey and Staking, Drainage Structure 	<p>For smaller 3R projects, the following pay item may be used:</p> <ul style="list-style-type: none"> 15201-0000 Construction Survey and Staking <p>In the SCRs, describe the work included in the LPSM item.</p>
<p>4R</p> <p>3R with Superelevation Correction</p> <p>3R with Widening</p> <p>3R with Minor Horizontal/Vertical Adjustments</p>	<ul style="list-style-type: none"> 15201-0000 Construction Survey and Staking 	<ul style="list-style-type: none"> 15225-0000 Slope, Reference, and Clearing and Grubbing Control 15236-2000 Survey Control, Grade Finishing 15215-3000 Survey and Staking, Drainage Structure

- a. Recommended Method of Measurement
 - Lump Sum (LPSM)
- b. Quantity Allowance & Rounding
 - For lump sum items, plan and bid quantities are the same
- c. Recommended Method for Estimating Unit Price
 - % of total cost



d. Pricing Considerations

- Determine the bid price of this work based on crew size, survey requirements & equipment, project terrain to estimate hours and cost.
- When using average bid prices from previous contracts, ensure the survey requirements are essentially the same or the comparison will be flawed.

e. Pricing Guidance

- While the price is estimated as a % of the total project cost, validate the cost by considering the project length, and the type and amount of staking that needs to be done.
- For projects > \$1,000,000, use 2%-3% of the contract subtotal. Round to the nearest \$1,000.
- For projects ≤ \$1,000,000, use 3.5% of the contract subtotal. Round to the nearest \$1,000.
- For DAR projects use 1% of the project subtotal. Round to the nearest \$500.



SECTION 153 – CONTRACTOR QUALITY CONTROL

<i>Project Type</i>	<i>Size</i>	<i>Typical Pay Item</i>
All Projects	All	<ul style="list-style-type: none"> 15301-0000 Contractor Quality Control Use the LPSM item for all projects. Also include a pay item for section 154.

- a. Recommended Method of Measurement
 - Lump Sum (LPSM)
- b. Quantity Allowance & Rounding
 - For lump sum items, plan and bid quantities are the same
- c. Recommended Method for Estimating Unit Price
 - % of total cost
- d. Pricing Considerations
 - If the project has a large amount of work that does not require testing or QC. i.e. a rock scaling project, then the percentage for this section may be lower.
- e. Pricing Guidance
 - Calculate project subtotal by summing all items except those from sections 151-155.
 - Use 3% of the contract subtotal. Round to the nearest \$1,000.
 - For DAR projects, use 1% of the contract subtotal. Round to the nearest \$500.
 - For projects > \$1,000,000, use 2%-3% of the total contract subtotal.



SECTION 154 - CONTRACTOR SAMPLING AND TESTING

<i>Project Type</i>	<i>Size</i>	<i>Typical Pay Item</i>
All Projects	All	<ul style="list-style-type: none"> 15401-0000 Contractor Testing <p>Use the LPSM item for all projects. Also include a pay item for section 153.</p>

- a. Recommended Method of Measurement
 - Lump Sum (LPSM)
- b. Quantity Allowance & Rounding
 - For lump sum items, plan and bid quantities are the same
- c. Recommended Method for Estimating Unit Price
 - % of total cost
- d. Pricing Considerations
 - If the project has a large amount of work that does not require testing or QC. i.e. a rock scaling project, then the percentage for this section may be lower.
- e. Pricing Guidance
 - Calculate project subtotal by summing all items except those from sections 151-155.
 - Use 2% - 3% of the contract subtotal. Round to the nearest \$1,000.



SECTION 155 – SCHEDULES FOR CONSTRUCTION CONTRACTS

<i>Project Type</i>	<i>Size</i>	<i>Typical Pay Item</i>
All Projects	All	<ul style="list-style-type: none"> • 15501-0000 Construction Schedule Use the LPSM item for all projects.

- a. Recommended Method of Measurement
 - Lump Sum (LPSM)
- b. Quantity Allowance & Rounding
 - For lump sum items, plan and bid quantities are the same.
- c. Recommended Method for Estimating Unit Price
 - % of total cost
- d. Pricing Considerations
 - Prices are highest on projects involving complex temporary traffic control plans, specific sequencing around work windows, or multiple construction seasons.
- e. Pricing Guidance
 - For projects that require a BCM schedule, use \$5,000.
 - For projects that require a CPM schedule calculate project subtotal by summing all items except those from sections 151-155. Use 0.5% of the contract subtotal, to a minimum of \$10,000. Round to the nearest \$1,000.
 - For projects > \$25,000,000, increase the minimum to \$100,000.

Note: Bids on this item are often lower than the Engineer's Estimate and are very rarely higher.



SECTION 157 – SOIL EROSION AND SEDIMENT CONTROL

<i>Project Type</i>	<i>Size</i>	<i>Typical Pay Item</i>
Projects with limited scope, such as OMAD, ERFO, and pavement preservation projects	All	<ul style="list-style-type: none"> • 15701-0000 Soil Erosion Control <p>In the SCRs, add a list of items of work included in the LPSM (do not need specific estimated quantities).</p> <ul style="list-style-type: none"> • For some of these projects, soil erosion is not paid for directly
3R and 4R	All	<ul style="list-style-type: none"> • Use the appropriate pay items for each of the erosion and sediment control devices used on the projects. Common pay items include: <ul style="list-style-type: none"> ➤ 15705-0100 Soil Erosion Control, silt fence LNFT ➤ 15705-1400 Soil Erosion Control, fiber roll LNFT ➤ 15706-0200 Soil Erosion Control, check dam EA ➤ 15706-1000 Soil Erosion Control, inlet protection EA

Soil erosion and sediment control can be done in two ways; either by lump sum or separating the items individually.

a. Recommended Method of Measurement

- Lump Sum (LPSM)
- EA (EACH)

b. Quantity Allowance & Rounding

- Quantities by linear feet – Round plan quantities up approximately 5% to obtain an even 10, 50, or 100 linear feet bid quantity.
- Quantities by each – Round plan quantities up approximately 5% to obtain an even 5 or 10 bid quantity.
- Quantities by square yard or acre – Round plan quantities up approximately 5% to obtain an even 10 or 50 square yard or acre bid quantity.

c. Recommended Method for Estimating Unit Price

- Historical Bid-Based



d. Pricing Guidance

- The total cost of erosion and sediment control items is typically 3% - 5% of the construction estimate.



SECTION 158 – WATERING FOR DUST CONTROL

<i>Project Type</i>	<i>Size</i>	<i>Typical Pay Items</i>	<i>Additional Options for Pay Items</i>
All Projects	All	<ul style="list-style-type: none"> • 15802-0000 Watering for Dust Control 	<ul style="list-style-type: none"> • 15801-0000 Watering for Dust Control <p>Considerations for where the pay item by the MGAL may be advantageous include:</p> <ul style="list-style-type: none"> ➤ Project soil types (high amounts of asbestos in the soils or soils are mainly fine grained) ➤ Residents within the project limits ➤ High political profile ➤ Project is within an area with high visitation ➤ Air quality regulations are unusually strict

a. Recommended Method of Measurement

- Lump Sum (LPSM)

b. Quantity Allowance & Rounding

- Not applicable

c. Recommended Method for Estimating Unit Price

- Historical Bid-Based

d. Pricing Considerations

- Consider the haul distance for the water and any royalties or premiums that must be paid for by the contractor.



SECTION 201 – CLEARING AND GRUBBING

<i>Project Type</i>	<i>Size</i>	<i>Typical Pay Item</i>
All Projects	All	<ul style="list-style-type: none"> • 20101-0000 Clearing and Grubbing

a. Recommended Method of Measurement

- Acre (ACRE)

Note: If lump sum is used as a payment, show the number of acres used for the lump sum calculations on the Summary of Quantities sheet or other plan sheet.

b. Quantity Allowance & Rounding

- Show plan quantities to the nearest 0.1 acre. Add approximately 3% to round up to the next 0.1 acre.

c. Recommended Method for Estimating Unit Price

- Historical Bid-Based

d. Pricing Considerations

- Vegetation density and size (e.g. dense of large trees vs. prairies with few trees)
- Terrain and accessibility (e.g. steeper terrain with inaccessible slopes vs. flat, open areas)
- Timber costs (e.g. any US Forest Service costs for tree removal)
- Haul
- Restrictive hours of work
- Handwork operations



SECTION 203 – REMOVAL OF STRUCTURES AND OBSTRUCTIONS

<i>Project Type</i>	<i>Size</i>	<i>Typical Pay Items</i>
All Projects	All	<ul style="list-style-type: none"> • 20304-1000 Removal of Structures and Obstructions <p>Typically use the LPSM pay item for removal of various structures and obstructions that are easily identified in the field, such as delineators, fences, curbs, signs, bollards, etc.</p> <p>Call out each removal item on the plans. Provide FIO quantities on the quantity tabulation.</p> <ul style="list-style-type: none"> • Removals may also be broken out into various pay items. Consider paying removals by the each, length, area, or volume for removal items that are underground or are anticipated to be high-cost or high-risk items. Example items include: <ul style="list-style-type: none"> ➤ 20301-1900 Removal of Pipe Culvert ➤ 20304-2000 Removal of Bridge

a. Recommended Method of Measurement

- Lump Sum (LPSM)
- Each (EA)

b. Quantity Allowance & Rounding

- Plan and bid quantities are usually the same for items paid by each, such as removal of light pole or removal of headwall.

c. Recommended Method for Estimating Unit Price

- Historical Bid-Based

d. Pricing Considerations

- Difficulty of removal and handwork
- Terrain and access
- Stockpiling salvaged materials
- Hazardous material handling and disposal



e. Pricing Guidance

- If average bid price data is not available for the work proposed, use cost based estimating method to determine the unit price.
- For cost-based estimate, include equipment rental rates, labor rates, and overhead & profit margins.



SECTION 204 – EXCAVATION AND EMBANKMENT

<i>Project Type</i>	<i>Size</i>	<i>Typical Pay Items</i>
All Projects	All	<p>Balanced & Waste projects:</p> <ul style="list-style-type: none"> • 20401-0000 Roadway Excavation <p>A Contractor will construct the embankment out of roadway excavation material and the Contractor is paid for both excavating and embanking under the Roadway Excavation pay item.</p> <p>Waste with special handling, storage, and disposal requirements:</p> <ul style="list-style-type: none"> • 20441-0000 Waste <p>For waste projects, use Item 20401-0000 Roadway Excavation unless there are specific requirements warranting separated payment for Waste. The Contractor will factor the waste material hauling into their bid price for roadway excavation if no waste item is included.</p> <p>Borrow projects:</p> <ul style="list-style-type: none"> • Typically use multiple pay items such as Roadway Excavation (Item 20401) and a borrow item such as Unclassified Borrow (Item 20403 or Item 20404). • Discuss the use of item 20420-0000 Embankment Construction with the CFT prior to inclusion.

a. Recommended Method of Measurement

- Cubic Yard (CUYD)

b. Quantity Allowance & Rounding

- For quantities ≤ 50,000 CUYD add approximately 10% to obtain an even 500 CUYD.
- For quantities > 50,000 add approximately 5% to obtain an even 1,000 CUYD.

c. Recommended Method for Estimating Unit Price

- Historical Bid-Based



d. Pricing Considerations

- Type of material
- Total excavation quantity
- Volume per mile
- Terrain, steeper slopes (will have a lower production rate)
- Type of equipment that will be used
- Subgrade and slope finishing



SECTION 207 – EARTHWORK GEOTEXTILES

- a. Recommended Method of Measurement
 - Square Yard (SQYD)
- b. Quantity Allowance & Rounding
 - For quantities > 3,000 sqyd add approximately 5%. Round to the nearest 500 sqyd.
 - For quantities ≤ 3,000 sqyd add approximately 10%. Round to the nearest 100 sqyd.
- c. Recommended Method for Estimating Unit Price
 - Historical Bid-Based
- d. Pricing Considerations for Separation and Stabilization of Geotextile and Geotextile Filter Applications
 - Woven vs non-woven geotextiles
 - If woven or non-woven is not specified, non-woven will be provided (see typical prices below)
- e. Pricing Guidance
 - Woven (typically used for stabilization) is around ~\$3/SY
 - Non-Woven (typically used for separation and filtration) is around ~\$1/SY



SECTION 208 – STRUCTURE EXCAVATION AND BACKFILL FOR SELECTED MAJOR STRUCTURES

<i>Project Type</i>	<i>Size</i>	<i>Typical Pay Items</i>
Projects with Shoring and Bracing	All	<ul style="list-style-type: none"> Shoring is the responsibility of the Contractor and is dependent on the Contractor’s operations. DO NOT provide quantities for, or include payment of, temporary shoring and bracing unless there are unusual circumstances on the project and it is recommended by the PM and Bridge or Geotech Engineer. Approval from the PM Branch Chief is required if it is recommended that shoring be paid for or quantified in the PS&E. In unusual circumstances where the payment is included it will be paid for by the LPSM.

a. Recommended Method of Measurement

- Cubic Yard (CUYD)

b. Quantity Allowance & Rounding

- Round plan quantities up approximately 5% to obtain an even 10, 50, or 100 CUYD bid quantity

c. Recommended Method for Estimating Unit Price

- Historical Bid-Based

d. Pricing Considerations

- Clearing vegetation and obstructions



SECTION 212 - LINEAR GRADING

<i>Project Type</i>	<i>Size</i>	<i>Typical Pay Items</i>
Projects with Grading	All	<ul style="list-style-type: none"> • 21201-0000 Linear Grading <ul style="list-style-type: none"> ○ Linear grading work is necessary to bring a roadway to the required grade and cross-section. The linear unit for measuring roadway excavation quantities is used when grading is expected to be minimal. • 21202-0000 Site Grading <ul style="list-style-type: none"> ○ Site grading work is ensuring a level base, or with a specified slope, for work such as a foundation, landscape or garden improvement, or surface drainage.

a. Recommended Method of Measurement

- Station
- For the bidders’ information, show the design earthwork quantity in *cubic yards* on the plans

b. Quantity Allowance & Rounding

- Round to the nearest 0.001 station

c. Recommended Method for Estimating Unit Price

- Historical Bid-Based
- Without a good history of average bid prices, use the cubic yards quantity to determine the unit price.

d. Pricing Considerations

- Consider the quantity of grading necessary
- Haul distance

e. Pricing Guidance

- Almost always a contract quantity



SECTION 251 – RIPRAP

<i>Project Type</i>	<i>Size</i>	<i>Typical Pay Items</i>
Projects with Riprap	All	<ul style="list-style-type: none"> • FP-14 Riprap pay item descriptions include both riprap class and acceptance testing method. Use the pay items for the appropriate riprap class, with the acceptance testing according to the following: <ul style="list-style-type: none"> ➤ For minor riprap, including riprap aprons at culverts with diameters of 48” or less, use <u>Method A</u> acceptance testing. For example, for riprap aprons at 24” culverts, use pay item 251-0200 Placed riprap, method A, class 2 ➤ For larger riprap, such as riprap aprons at culverts with diameters larger than 48” or for bridge protection, use <u>Method B</u> acceptance testing. For example, 25101-2600 Placed riprap, method B, class 6

a. Recommended Method of Measurement

- Cubic Yard (CUYD)
- For some applications, such as riprap lined ditches, consider paying by Linear Feet (LNFT)

b. Quantity Allowance & Rounding

- Add approximately 10% to obtain an even 50, 100, or 500 CUYD.

c. Recommended Method for Estimating Unit Price

- Historical Bid-Based

d. Pricing Considerations

- Only use bid histories for the same class of riprap.

Price will vary if this is produced from rock on the project vs sourced off the project.



SECTION 253 – GABIONS

<i>Project Type</i>	<i>Size</i>	<i>Typical Pay Items</i>
Projects with Gabion	All	<ul style="list-style-type: none"> • 25301-0000 Gabions • 25301-1000 Gabions, Galvanized or Aluminized Coated • 25301-2000 Gabions, Polyvinyl Chloride Coated

a. Recommended Method of Measurement

- Square Foot (SQFT)

b. Quantity Allowance & Rounding

- Round the plan quantities approximately up to 5% to the nearest 100 SQFT.
- Include estimated steps at top and bottom of the wall.

c. Recommended Method for Estimating Unit Price

- Historical Bid-Based

d. Pricing Considerations

- Wire type: welded wire fabric or double-twisted wire (more expensive)
- Basket filling method: mechanically placed gabion rock or hand-placed gabion rock (more expensive)
- Weathering agent: Natina or similar weathering agent will add cost and delivery time

e. Pricing Guidance

- Highly variable based on pricing considerations listed above and local site conditions. Meet with GEO project team member to determine appropriate pay item and unit pricing.



SECTION 255 – MECHANICALLY STABILIZED EARTH WALLS

<i>Project Type</i>	<i>Size</i>	<i>Typical Pay Item</i>
Projects with MSE Walls	All	<ul style="list-style-type: none"> • 25501-0000 Mechanically Stabilized Earth Wall

a. Recommended Method of Measurement

- Square Foot (SQFT)

b. Quantity Allowance & Rounding

- Round the plan quantities approximately up to 3% to the nearest 100 SQFT.
- Include estimated steps at top and bottom of the wall.

c. Recommended Method for Estimating Unit Price

- Historical Bid-Based

d. Pricing Considerations

- Facing types: wire basket, segmental retaining wall unit, pre-cast concrete, etc.
- Availability of materials: select granular backfill and facing/drain rock.
- Grid length to height ratio: taller walls will be more expensive per unit area due to longer grids and associated backfill volumes.
- Temporary shoring: if incidental, then will add to unit cost
- Weathering agent: Natina or similar weathering agent will add cost and delivery time
- Will road be closed to public, or will the contractor have to pass traffic through the work zone? There will be production delays due to passing traffic as well as increased quantities to construct shallow ramps into the backfill zone for highway vehicles.

e. Pricing Guidance

Highly variable based on pricing considerations above and local site conditions Meet with GEO project team member to determine appropriate pay item and unit pricing. For preliminary estimating, and as a rule of thumb, use the following:

- Low range: \$30 to 50 / SQFT:
 - Large quantities: >10,000 SF
 - Shorter walls: <10 feet



- Mid-range: \$50 to 70 / SQFT:
 - Moderate quantities: 2000 SF to 10,000 SF
 - Medium height walls: 10 to 20 feet
- High-range: \$70 to 90 / SQFT:
 - Small quantities: <2000 SF
 - Taller walls: >20 feet
- Weathering agent: add ~\$5 / SQFT



SECTION 257 – CONTRACTOR DESIGNED RETAINING WALLS

<i>Project Type</i>	<i>Size</i>	<i>Typical Pay Item</i>
Projects with walls designed by the Contractor	All	<ul style="list-style-type: none"> • 25701-0[1 through 10]00 Contractor Furnished [<i>type</i>] wall design <ul style="list-style-type: none"> ➤ This pay item is for Contractor-designed walls and includes just the cost of the design services. The wall construction pay items are included in the various wall sections.

a. Recommended Method of Measurement

- Lump Sum (LPSM)

b. Pricing Guidance

- Collaborate with the Geotechnical CFT member to estimate these items.



SECTION 261 – REINFORCED SOIL SLOPES

<i>Project Type</i>	<i>Size</i>	<i>Typical Pay Items</i>
Projects with Reinforced Soil Slopes	All	<ul style="list-style-type: none"> • 20420-0000 Embankment Construction • 207xx-xxxx (The Geotechnical Engineer will recommend the type of geotextile to use) • Coordinate with Geotechnical Engineer to confirm pay items for the project

a. Recommended Method of Measurement

- Square Feet (SQFT) – specify whether the area is measured horizontally or vertically to the surface being measured per section 109.02(o). Use projection that results in higher quantity.

b. Quantity Allowance & Rounding

- Round the plan quantities approximately up to 3% to the nearest 100 SQFT.
- Include estimated steps at top and bottom of the slope, if stepped.

c. Recommended Method for Estimating Unit Price

- Historical Bid-Based

d. Pricing Considerations

- Facing materials: For finished slopes 1V:1.5H and shallower, assume a pinned, turf reinforcement mat (TRM) or rolled erosion control product (RECP) over topsoil will be used. For finished slopes steeper than 1V:1.5H, typical facing is riprap or special rock embankment material, can be planted with cellular confining systems or stepped with wire-face baskets, wrapped geogrids, etc.
- Availability of materials: select borrow or select granular backfill
- Grid length to height ratio: taller slopes will be more expensive per unit area due to longer grids and associated backfill volumes.
- Temporary shoring: if incidental, then will add to unit cost
- Will road be closed to public, or will the contractor have to pass traffic through the work zone? There will be production delays due to passing traffic as well as increased quantities to construct shallow ramps into the backfill zone for highway vehicles.



e. Pricing Guidance

- Consider paying for facing as separate pay item (e.g., TRM or RECP, riprap, topsoil, turf establishment, etc.). This may help with quantity pricing for those items.
- Highly variable based on pricing considerations listed above and local site conditions. Meet with GEO project team member to determine appropriate pay item and unit pricing.



SECTION 301 – UNTREATED AGGREGATE COURSE

<i>Project Type</i>	<i>Size</i>	<i>Typical Pay Items</i>
Projects with less than 5,000 tons of aggregate base	Smaller	<ul style="list-style-type: none"> • See <u>SECTION 302</u>
Projects with more than 5,000 tons of aggregate base	Larger	<ul style="list-style-type: none"> • 30103-0000 Aggregate base <ul style="list-style-type: none"> ➤ The Contractor may select the grade of aggregate base to use, so avoid using the pay items that have the grade specified. ➤ To calculate the materials incentive, use the WFL Incentives and Adjustments https://highways.dot.gov/federal-lands/estimates/wfl/incentives-adjustments

a. Recommended Method of Measurement

- Cubic Yard In-Place (CUYD)
- Square Yard

Note: The method of measurement for typical pay items under this section is CUYD, discuss with Construction and Materials before using a different measurement method.

b. Quantity Allowance & Rounding

- Add a 5% - 10% allowance to quantities measured by cubic yard so the bid schedule quantity is an even 500 or 1000 cubic yards.
- Square yard measurements require little allowance as the limits are well defined on the Typical Sections.
- Round up to an even 1000 square yards for the bid schedule

c. Recommended Method for Estimating Unit Price

- Historical Bid-Based



d. Pricing Considerations

- If necessary, determine the hauling vehicle (loose) volume, multiply the compacted volume by 1.33.
- To determine loose tons:
 - i. Multiply the compacted volume by 1.33
 - ii. Convert to tons by multiplying by 1.4 tons/cuyd
 - iii. Compensate for the mixing water by multiplying by 1.06

The 1.4 tons/cuyd factor applies to aggregate with a specific gravity of around 2.70. For sources with significantly different specific gravity, it is appropriate to multiply the 1.4 factor by the known specific gravity divided by 2.70.

e. Pricing Guidance

- Collaborate with the Materials and Pavements CFT member to estimate these items.



SECTION 302 – TREATED AGGREGATE COURSES

<i>Project Type</i>	<i>Size</i>	<i>Typical Pay Items</i>
Projects with less than 5,000 tons of aggregate base	Smaller	<ul style="list-style-type: none"> • 30201-2000 Roadway Aggregate, method 2
Projects with more than 5,000 tons of aggregate base	Larger	<ul style="list-style-type: none"> • Refer to the table at <u>SECTION 301</u>

a. Recommended Method of Measurement

- Cubic Yard In-Place (CUYD)
- Square Yard

Note: The method of measurement for typical pay items under this section is CUYD, discuss with Construction and Materials before using a different measurement method.

b. Quantity Allowance & Rounding

- Add a 5% - 10% allowance to quantities measured by cubic yard so the bid schedule quantity is an even 500 or 1000 cubic yards.
- Square yard measurements require little allowance as the limits are well defined on the Typical Sections.
- Round up to an even 1000 square yards for the bid schedule.

c. Recommended Method for Estimating Unit Price

- Historical Bid-Based

d. Pricing Considerations

- If necessary, determine the hauling vehicle (loose) volume, multiply the compacted volume by 1.33.
- To determine loose tons:
 - i. Multiply the compacted volume by 1.33
 - ii. Convert to tons by multiplying by 1.4 tons/cuyd
 - iii. Compensate for the mixing water by multiplying by 1.06



The 1.4 tons/cuyd factor applies to aggregate with a specific gravity of around 2.70. For sources with significantly different specific gravity, it is appropriate to multiply the 1.4 factor by the known specific gravity divided by 2.70.

e. Pricing Guidance

- Collaborate with the Materials and Pavements CFT members to estimate these items



SECTION 303 – ROAD RECONDITIONING

<i>Project Type</i>	<i>Typical Pay Items</i>
Projects with reconditioning of ditches, shoulders, roadbed and/or aggregate surfaces	<ul style="list-style-type: none"> • 30301-5000 Aggregate Surface Reconditioning • 30302-1000 Ditch Reconditioning

a. Recommended Method of Measurement

- Linear Foot (LNFT) or Mile (MILE)

b. Quantity Allowance & Rounding

- Round miles to the nearest 0.01 mi for the bid schedule.
- Add 5% - 10% to the square yard to obtain an even 100 sqyd or 500 sqyd in the bid schedule.

c. Recommended Method for Estimating Unit Price

- Cost-Based

d. Pricing Considerations

- Consider the subgrade material; expect higher costs for subgrade with significant areas of unsuitable material.
- Include equipment and labor costs for grade finishing.

e. Pricing Guidance

- Collaborate with the Materials and Pavements CFT member to estimate these items.



SECTION 304 – FULL DEPTH RECLAMATION

<i>Project Type</i>	<i>Typical Pay Item</i>
Projects with Full Depth Reclamation	<ul style="list-style-type: none"> • 30401 Full Depth Reclamation, method 2, xx-inch Depth <ul style="list-style-type: none"> ➤ Typically pay for <u>Section 304</u> Full Depth Reclamation using method 2 ➤ Include the depth of pulverizing in the pay item description

a. Recommended Method of Measurement

- Mile (MILE)

b. Quantity Allowance & Rounding

- Add an allowance of 5% - 10% to obtain an even 100 or 500 SQYD



SECTION 305 – FULL DEPTH RECLAMATION WITH CEMENT

<i>Project Type</i>	<i>Typical Pay Items</i>
Projects with Full Depth Reclamation with Cement Additive	<ul style="list-style-type: none"> • 30501 Full Depth Reclamation with Cement, xx-inch Depth • 30510-0000 Cementitious Material

a. Recommended Method of Measurement

- Mile (MILE)
- Ton (TON)

b. Quantity Allowance & Rounding

- Add an allowance of 5% - 10% to obtain an even 100 or 500 SQYD.



SECTION 306 – FULL DEPTH RECLAMATION WITH ASPHALT

<i>Project Type</i>	<i>Typical Pay Items</i>
<p>Projects with Full Depth Reclamation with Asphalt Additive</p>	<p>For FDR with emulsified asphalt:</p> <ul style="list-style-type: none"> • 30601 Full Depth Reclamation with emulsified asphalt, xx-inch Depth • 30614-0000 Emulsified Asphalt <p>For FDR with foamed asphalt:</p> <ul style="list-style-type: none"> • 30603 Full Depth Reclamation with foamed asphalt, xx-inch Depth • 30613-0000 Asphalt Binder

a. Recommended Method of Measurement

- Mile (MILE)
- Ton (TON)
- Square Yard (SQYD)

b. Quantity Allowance & Rounding

- Add an allowance of 5% - 10% to obtain an even 100 or 500 SQYD.



SECTION 310 – COLD IN-PLACE RECYCLED ASPHALT BASE COURSE

<i>Project Type</i>	<i>Typical Pay Items</i>
Projects with CIPR	<ul style="list-style-type: none"> • 31001-1000 Cold In-Place Recycled Asphalt Base Course, Type A • 31010-0000 Emulsified Asphalt • Additive (either 31011-0000 Lime or 31012-0000 Cement)

a. Recommended Method of Measurement

- Square Yard (SQYD)

b. Quantity Allowance & Rounding

- Round plan quantities up approximately 3% to the nearest 1,000 SQYD

c. Recommended Method for Estimating Unit Price

- Cost-Based



SECTIONS 401, 403 - ASPHALT PAVEMENT

<i>Description</i>	<i>Typical Pay Items</i>
<p>Small non-mainline paving areas (small pullouts, paved ditches, small approach roads, trails) where the government wants little control</p>	<ul style="list-style-type: none"> ● 40301-0200 Asphalt Concrete Pavement, Type 2 <ul style="list-style-type: none"> ➤ Typically, less than 100 tons ➤ Uses certification acceptance ➤ Used on non-mainline areas
<p>Projects where testing for conformance is preferred over statistical acceptance (local mix used or variability in placement of mix is anticipated)</p>	<ul style="list-style-type: none"> ● 40301-0100 Asphalt Concrete Pavement, Type 1 <ul style="list-style-type: none"> ➤ Typically, more than 100 tons ➤ Use of local mix (state DOT) required; job specific mix not desired ➤ Uses conformance testing ➤ Good choice when bid quantity is insufficient for statistical analysis (less than 7,000 tons of mix on project). May use for larger quantities if appropriate ➤ Good choice when a lot of anticipated starts and stops during HACP production or non-mainline paving is anticipated
<p>Most projects where there is more than 7,000 tons of asphalt</p>	<ul style="list-style-type: none"> ● 40101-5600 Asphalt Concrete Pavement, Gyratory Mix, ½ or ¾ inch nominal maximum size aggregate, 0.3 to < 3million ESAL <ul style="list-style-type: none"> ➤ Uses statistical acceptance ➤ In general, projects with more than about 7,000 tons of asphalt will use the <u>Section 401</u> pay items ● 40105-3000 Antistrip additive, Type 3



a. Recommended Method of Measurement

- Ton (TON)

b. Quantity Allowance & Rounding

- Add an allowance of approximately 3-5% that takes the pay item total up to an even 500 or 1,000 ton.

c. Recommended Method for Estimating Unit Price

- Historical Bid-Based

d. Conversion Factors

- For dense graded mixes, multiply the volumes by 0.072 tons/cubic feet to obtain tonnage for items in sections 401-403. This factor assumes a plant mix mass unit weight of 145 lb/cubic feet.

A dense graded mix is a well-graded (even distribution of aggregate particles from coarse to fine), dense HMA mixture consisting of aggregates and asphalt binder.

- For open-graded mixes, multiply the volume by the ton per cubic foot factor, which is contained in the Materials Recommendations Memo.

Open graded mixes are designed to be permeable to water, which differentiates them from dense graded mixtures that are relatively impermeable. These mixtures use only crushed stone or, in some cases, crushed gravel with a small percentage of manufactured sands.

e. Pricing Guidance

- Quantity
- Source, i.e. commercial or contractor developed
- Type of mix – 401, 402, 403, etc.
- Smoothness – Typically there will be incentive or disincentive payments associated with the final pavement smoothness measure. If the project is 3-R type project, these pay adjustments may be based on the percent improvement in the smoothness measurements from the original surface condition compared to the final paved surface. Contact the Division Materials Engineer if there are questions regarding smoothness measurement for the specific contract.
- Collaborate with the Materials and Pavements CFT member to estimate these items.

Note: An example of Pavement Recommendation memo is provided for reference. (See the following 3 pages)





U.S. Department
of Transportation

**Federal Highway
Administration**

Memorandum

Western Federal Lands Highway Division
610 E. Fifth Street
Vancouver, WA 98661-3801

TO: Helen Oppenheimer, PM
Michael Madar, HDM
Jennifer Longmore, Designer
Robert Kraig, Geotechnical Engineer

In Reply Refer to:
HFL-17

FROM: Aaron Coenen, Assistant Materials Engineer

AARON R COENEN

DATE: November 2, 2020

SUBJECT: INFORMATION:
Amendment 1: Final Structural Pavement Recommendation Rehabilitate
East Rim Drive OR NPS CRLA 13(1)

Background

This memorandum is an amendment to the final pavement structural recommendations for the Rehabilitate East Rim Drive project dated April 24, 2020. This project is located in Crater Lake National Park, Oregon.

Subsurface Materials and Existing Pavement Structure

A geotechnical investigation was performed in Fall of 2019. The subgrade materials were classified predominantly as A-1-b(0) silty sand with gravel, with isolated areas of A-1-a(0) poorly graded gravel with silt and sand, and A-2-4 silty sand. R-value testing of the subgrade materials resulted in values between 70 and 77. The relative quality of roadbed soil is identified as “very good.”

The existing pavement structure measured 6-inches nominal depth, which included asphalt concrete pavement varying between 1-inch to 3-inches thick over gravel base. The existing asphalt concrete pavement and base course should be removed and stockpiled for future use by milling 6 inches within the roadway prism and 4 inches in turnouts. This process will allow for adjustments to the design profile and provide adequate space for the new pavement structure while retaining the necessary reveal on masonry guardwalls and tying in to existing structures. This material is of high quality and is suitable for use as a recycled aggregate base, or for constructing embankments. If recycling the existing pavement and base is not feasible, then the existing pavement structure should be classified as excess excavation and removed from the project. Removal of an additional 4 inches of material is needed in the roadway prism to accommodate use of recycled aggregate base material. This removal should be classified as excess material excavation and not combined with any stockpiled millings. For construction sequencing, it is not recommended to remove the existing pavement structure for the entire corridor at one time. The subgrade materials would be adversely affected by the construction loading and exposure to moisture.



Traffic Data

Traffic data was provided as part of the project proposal. The AADT is 200. Historic growth is 2%. The percent trucks is estimated to be higher than average to account for construction loading within the project limits. The assumed traffic loading projects the 18-kip ESALs for a 25-year design life to be less than 300,000. Due to the low projected ESALs, a low-volume catalog design will be used.

Recommended Pavement Structure

The specified layer design was determined from the 1993 AASHTO Pavement Design Guide, Low-Volume Road Design. Based on regional climate maps, the climatic region corresponding to the project location is Region VI (Dry, Hard Freeze, Spring Thaw). The design life for this pavement structure is 25 years.

The following is recommended for the roadway structure:

4 inches – Asphalt Concrete Pavement, Gyratory Mix, 1/2-inch or 3/4-inch nominal maximum aggregate size, 0.3 to <3 million ESAL, type III smoothness (Section 401, estimated @ 1.94 tons/cuyd); and,

6 inches – Recycled Aggregate Base (Section 308, estimated at 1.97 tons/cuyd).

The recommendation remains consistent for any areas of turnout expansion, while existing turnouts will be constructed of 4 inches asphalt concrete pavement placed atop the exposed aggregate resulting from the 4-inch removal process (i.e., no additional removal is anticipated in turnouts to substitute in-situ materials with recycled aggregate base, however, available stockpiled millings should be used as aggregate base course in areas of turnout expansion). If recycling of the existing asphalt and base course is not feasible, or if insufficient quantity exists and the recycled aggregate base needs to be supplemented, then the 6 inches - Recycled Aggregate Base (Section 308) may be substituted with:

6 inches – Aggregate Base Grading D (Section 301, estimated at 1.97 tons/cuyd).

The recycled aggregate base and subgrade materials should not be left exposed over a winter shutdown. These areas, including subgrade repairs, should be constructed through the bottom two inch lift of asphalt concrete pavement. The final lift of asphalt concrete pavement should be placed in one operation in the final season.

Additional Bid Items required for this roadway segment:

Antistrip additive, type 3 (Section 401, estimated @ 1% by weight of Item 40101); Tack coat (Section 412, estimated at 0.10 gal/yd² per application, 240 gal/ton); and, Flagger (Section 635, estimated at 2 days minimum duration) for pavement roughness measurements after paving.



Specifications

Materials will provide any required SCRs.

Pavement smoothness is designated as Type III. The asphalt concrete pavement should be placed in two equal lifts. Asphalt Binder is designated as PG58-28.

Should new information develop that impacts the information and assumptions made in this recommendation, the pavement design should be reexamined.

cc: Materials/Pavement File



SECTION 405 – OPEN GRADED FRICTION COURSE

<i>Project Type</i>	<i>Typical Pay Items</i>
Projects with OGFC	<ul style="list-style-type: none"> • 40501-0100 Open Graded Asphalt Friction Course, Grading A or B • 40505-3000 Antistrip Additive, Type 3

a. Recommended Method of Measurement

- Ton

b. Quantity Allowance & Rounding

- Add an allowance of approximately 3-5% that takes the pay item total up to an even 500 or 1,000 ton.

c. Recommended Method for Estimating Unit Price

- Historical Bid-Based

d. Pricing Guidance

- Collaborate with the Materials and Pavements CFT member to estimate these items.



SECTION 407 – CHIP SEAL

- a. Recommended Method of Measurement
 - Ton (TON)
- b. Quantity Allowance & Rounding
 - Add an allowance of approximately 3-5% that takes the pay item total up to an even 500 or 1,000 ton.
- c. Recommended Method for Estimating Unit Price
 - Historical Bid-Based
- d. Pricing Guidance
 - Collaborate with the Materials and Pavements CFT member to estimate these items.



SECTION 411 – ASPHALT PRIME COAT

<i>Project Type</i>	<i>Typical Pay Items</i>
Projects with Prime Coat	<ul style="list-style-type: none"> • Select either Method 1 or Method 2 • Method 1 (Topical) <ul style="list-style-type: none"> ➤ 41102-1000 Prime Coat, Method 1 ➤ 41105-0000 Blotter • Method 2 (Inverted Prime) <ul style="list-style-type: none"> ➤ 41102-2000 Prime Coat, Method 2 ➤ 41106-0000 Crushed Aggregate

a. Recommended Method of Measurement

- Ton (TON)

b. Quantity Allowance & Rounding

- Prime coat: Round up to approximately 5% to an even 10 tons
- Blotter: Round up to an even 10 or 100 tons

c. Recommended Method for Estimating Unit Price

- Historical Bid-Based

d. Conversion Factors

- To estimate the quantity of blotter, use estimated application rate 14.75 lb/yd², and 20% of the calculated surface area of the aggregate base course.
- To estimate the quantity of crushed aggregate, refer to the FP-14 Subsection 411.06 (b) for application rate.

e. Pricing Guidance

- Collaborate with the Materials and Pavements CFT member to estimate these items.



SECTION 412 – ASPHALT TACK COAT

<i>Project Type</i>	<i>Typical Pay Items</i>
Projects with Tack Coat	<ul style="list-style-type: none"> • 41201-0000 Tack Coat

- a. Recommended Method of Measurement
 - Ton (TON)
- b. Quantity Allowance & Rounding
 - Round up to an even 5 or 10 tons
- c. Recommended Method for Estimating Unit Price
 - Historical Bid-Based
- d. Conversion Factors
 - Use an application rate of 0.008 gal/sq-ft for plan quantities.
- e. Pricing Guidance
 - Collaborate with the Materials and Pavements CFT member to estimate these items.

Note: Asphalt Tack Coat needs to be included between each lift.



SECTION 602 – CULVERTS AND DRAINS

a. Recommended Method of Measurement

- Linear Foot (LNFT)
- Each (EACH) for End Sections

b. Quantity Allowance & Rounding

- Round plan quantities up approximately 5% to the nearest 10 ft.

c. Recommended Method for Estimating Unit Price

- Historical Bid-Based

d. Pricing Considerations

- Haul distance for materials, e.g. is the reinforced concrete pipe readily available locally?
- Difficulty of installation, e.g. is the culvert in a deep fill or is the subgrade material difficult to work in (rock or highly erodible)? Will installation be phased to accommodate traffic?
- Quantity



SECTION 604 – MANHOLES, INLETS, AND CATCH BASINS

<i>Project Type</i>	<i>Typical Pay Items</i>
<p>Projects with Manholes or Drop Inlets</p>	<ul style="list-style-type: none"> • To use a drop inlet standard from a State DOT, use the generic 60403 pa item and add the state description in parenthesis to the pay item description. For example, 60403-0000 Inlet (Caltrans Type GOL) • To use one of the FLH Standard drawings, use the 60403 pay items with 'FLH' in the description. For example, when using FLH Standard Drawing 604-5 Inlet, Type 5A, use pay item 60403-1200 Inlet, FLH Type 5A

a. Recommended Method of Measurement

- Each (EA)

b. Quantity Allowance & Rounding

- Plan and bid quantities are usually the same

c. Recommended Method for Estimating Unit Price

- Historical Bid-Based

d. Pricing Considerations

- Will installation occur under temporary traffic control, or will the road be closed to traffic?
- Is the project full reconstruction or rehabilitation? Replacement of existing inlets, etc. may be more labor intensive than new inlets installed with full reconstruction.



SECTION 605 – UNDERDRAINS, SHEET DRAINS, AND PAVEMENT DRAINS

<i>Project Type</i>	<i>Typical Pay Items</i>
Projects with Underdrain	<ul style="list-style-type: none"> • 60506-0000 Standard or Geocomposite Underdrain System <p>Use this pay item to allow the contractor the option of using either type of underdrain.</p> <p><i>Note: If Geotech decides that one of underdrain is preferable based on site-specific conditions, use pay items 60501-0000 Standard Underdrain System or 60502-0000 Geocomposite Underdrain System.</i></p>

a. Recommended Method of Measurement

- Linear Foot (LNFT)

b. Quantity Allowance & Rounding

- Round plan quantities up to approximately 5% to the nearest 5 or 10 ft.

c. Recommended Method for Estimating Unit Price

- Historical Bid-Based

d. Pricing Considerations

- The pay item for perforated underdrain may be modified to include the geotextile and the backfill.
- Is the project full reconstruction or rehabilitation? Installing underdrains at spot locations may be more labor intensive than new underdrains installed during full reconstruction.



SECTION 609 – CURB AND GUTTER

<i>Project Type</i>	<i>Typical Pay Items</i>
Projects with Paved Ditch	<ul style="list-style-type: none"> • 60908-1000 Paved Ditch, Asphalt

a. Recommended Method of Measurement

- Linear Foot (LNFT)

b. Quantity Allowance & Rounding

- Round plan quantities up to approximately 2% for mainly parking lot work and 5% for mainly roadway ditch work
- Round quantities to the nearest 50 or 100 ft. for roadway ditch work
- Round quantities up by approximately 2% to the nearest 10 or 20 ft for curb and gutter work

c. Recommended Method for Estimating Unit Price

- Historical Bid-Based

d. Pricing Considerations

- Haul distances for materials.
- Expect higher costs for curb that requires more difficult installation (i.e. on tight radii, unique shape and size, or hand forming required).
- Include additional cost for any concrete coloring.



SECTION 617 – GUARDRAIL

<i>Project Type</i>	<i>Typical Pay Items</i>
All Projects	<ul style="list-style-type: none"> • See 617 Standard Drawing/Details “Notes to the Designer” sheets for typical pay items when guardrail is used.

a. Recommended Method of Measurement

- Linear Foot (LNFT) for Guardrail and Structure transition rail
- Each (EACH) for Terminals

b. Quantity Allowance & Rounding

- Round plan quantities up to approximately 3% to the nearest 25 ft.

c. Recommended Method for Estimating Unit Price

- Historical Bid-Based

d. Pricing Considerations

- Consider the subgrade material near guardrail; expect higher costs if the guardrail will be installed in rocky subgrade or bedrock.
- Consider special connections to structures; expect higher costs if complicated connections are required at box culverts or other structures.
- Expect higher costs for aesthetic treatments such as weathering agent, powder coating or weathering steel.
- Consider obtaining contractor quotations when guardrail is a significant percentage of construction items.
- Rehabilitation projects with new guardrail may require grading work along standard runs of guardrail and/or at the terminals. It is preferred to use grading or other pay items to accommodate this work. If this work must be incidental to 617 pay items, the costs will need to be included in these pay items.



e. Pricing Guidance

- Increase the unit price if longer steel posts (8') are required for some or all of the quantity. Some bid history may show "(8' POSTS)" in the pay item descriptor.
- Quotes for weathering agent (e.g. Natina) can be obtained directly from the supplier. The quote is supplied in \$/LNFT and can be added to the historical bid data for traditional guardrail.



SECTION 622 – RENTAL EQUIPMENT

<i>Project Type</i>	<i>Size</i>	<i>Typical Pay Items</i>
Projects limited Scope, such as OMAD and pavement preservation projects	All	<ul style="list-style-type: none"> • 62201-0050 Dump truck, 5 cubic yard minimum capacity • 62201-0450 Backhoe loader, 4 cubic foot minimum rated bucket, 18-inch
ERFO	All	<ul style="list-style-type: none"> • 62201-0150 Dump truck, 7 cubic yard minimum capacity • 62201-0900 Wheel loader, 2 cubic yard minimum capacity • 62201-3350 Hydraulic excavator, 1 cubic yard minimum capacity
3R and 4R	All	<ul style="list-style-type: none"> • 62201-0200 Dump truck, 8 cubic yard minimum capacity • 62201-0550 Backhoe loader, 6 cubic foot minimum rated capacity bucket, 24-inch width • 62201-0950 Wheel loader, 3 cubic yard minimum capacity • 62201-1300 Bulldozer, 350HP minimum flywheel capacity • 62201-2850 Motor grader, 12-foot minimum blade • 62201-3350 Hydraulic excavator, 1 cubic yard minimum capacity

a. Recommended Method of Measurement

- Hour (HOUR)

b. Quantity Allowance & Rounding

- Round up to nearest 10 hours
- Place all quantities in the Allowance column

c. Recommended Method for Estimating Unit Price

- Cost-Based

d. Pricing Considerations

- Determine the size and type of equipment needed to perform the work.



SECTION 623 – GENERAL LABOR

<i>Project Type</i>	<i>Size</i>	<i>Typical Pay Items</i>
All Projects	All	<ul style="list-style-type: none"> • 62301-1000 General Labor • 62302-1000 Special Labor, hired technical services • 62302-1100 Special Labor, hired survey services

- a. Recommended Method of Measurement
 - Hour (HOUR)
- b. Quantity Allowance & Rounding
 - Round up to the nearest 10 hours
 - Place all quantities in the Allowance column
- c. Recommended Method for Estimating Unit Price
 - Historical Bid-Based
- d. Pricing Considerations
 - If cost of equipment in 622 does not include operator, include operator hours here.



SECTION 624 - TOPSOIL

a. Recommended Method of Measurement

- Square Yard (SQYD)
- Acre (ACRE)

b. Quantity Allowance & Rounding

- Round plan quantities up to approximately 5% to obtain an even 50 or 100 SQYD or ACRE

c. Recommended Method for Estimating Unit Price

- Historical Bid-Based

d. Pricing Considerations

- Access
- Haul distance
- Stockpiling



SECTION 625 – TURF ESTABLISHMENT

a. Recommended Method of Measurement

- Square Yard [SQYD]
- Acre (ACRE)

Note: When measuring Turf Establishment and supplemental applications by acre, measure on the ground surface.

b. Quantity Allowance & Rounding

- Round plan quantities up to approximately 5% to obtain an even 50 or 100 SQYD or ACRE

c. Recommended Method for Estimating Unit Price

- Historical Bid-Based

d. Pricing Considerations

- Geographic considerations
- Fertilizer and seed type
- Application methods



SECTION 634 – PERMANENT PAVEMENT MARKINGS

<i>Project Type</i>	<i>Size</i>	<i>Typical Pay Items</i>
Projects with Pavement Markings	All	<ul style="list-style-type: none"> Use pay items with pay unit by the length (63401 and 63402 items. Do not use pay items with GAL units (63404 items). <p><i>Note: Refer to FP-14 Subsection 634.12 for guidance on quantity measurement.</i></p>

- a. Recommended Method of Measurement
 - Linear Foot (LNFT)
- b. Quantity Allowance & Rounding
 - Round plan totals by adding an allowance that is appropriate to cover connections and intersections (Minimal Rounding)
- c. Recommended Method for Estimating Unit Price
 - Historical Bid-Based
- d. Pricing Considerations
 - When using durable type materials, state DOT bid history is best resource.



SECTION 635 – TEMPORARY TRAFFIC CONTROL

<i>Project Type</i>	<i>Size</i>	<i>Typical Pay Items</i>	<i>Additional Options for Pay Items</i>
All Projects	All	<ul style="list-style-type: none"> • 63502-0700 Temporary Traffic Control, cone • 63502-1300 Temporary Traffic Control, drum • 63503-0300 Temporary Traffic Control, barricade type 3 • 63503-1000 Temporary Traffic Control, plastic fence • 63504-1000 Temporary Traffic Control, construction sign • 63505-1000 Temporary Traffic Control, pavement markings • 63506-0500 Temporary Traffic Control, flagger • 63506-0600 Temporary Traffic Control, pilot car 	<p>Projects with significant issues with traffic or safety:</p> <ul style="list-style-type: none"> • 63510-0100 Temporary Traffic Control, traffic control supervisor <p>Projects where the roadway will be closed, simple traffic control or very low ADT:</p> <ul style="list-style-type: none"> • 63501-0000 Temporary Traffic Control

a. Recommended Method of Measurement

- Each (EA)
- Linear Foot (LNFT)
- Square Foot (SQFT)
- Mile (MILE)
- Hour (HOUR)

b. Quantity Allowance & Rounding

- Add an allowance of 5% - 10%

c. Recommended Method for Estimating Unit Price

- Cost-Based



d. Pricing Considerations

- Review the assumptions made for the cost-based unit price items and verify that the hours estimated for both flaggers and pilot car match the assumptions
- Assure that the requirements included in the SCRs are addressed with adequate temporary traffic control items and quantities
- Road closures, nighttime construction, length of construction zone, number of intersections, and traffic volume during the construction period are critical elements of consideration for temporary traffic control.



6. FOR INFORMATION ONLY QUANTITIES

6.1 General

Many bid items require multiple materials and multiple steps to perform the full scope of the bid item. For example, installing a 48-inch culvert involves procuring materials, staking the culvert, removing an existing culvert, excavating the trench, placing bedding, placing the culvert, and backfilling the culvert. All this work is covered under one bid item “48-inch pipe culvert.” In many situations, a contractor can use the information provided in the PS&E to estimate their bid prices -- information such as the drainage summary, drainage details and standard drawings, the design model, cross-sections and the plan and profile sheets.

In some situations, the scope of work may be more unique, or the work and the material quantities associated with performing a bid item may not be readily apparent from the resources listed above. In this case, the Designer needs to add information to the Plans to enable bidders to accurately estimate their price for performing the work.

The following table presents examples of items that typically need “For Information Only” quantities. This list is not all inclusive, and there are many more cases in which to provide “For Information Only” quantities.

Table 3. Common Examples of Bid Items that Have “For Information Only” Quantities

Bid Item	For Information Only work/quantities
Roadway Excavation	Embankment
Structural concrete	Structural Excavation
Retaining walls	See Example 1
Temporary Traffic Control	see Example 2
Erosion Control	list the various devices
Temporary Diversion Channels	list the various components

Include all support for “For Information Quantities” in the quantity calculations for the bid item. The quantity calculations are provided to the Project Engineer via the PE Hold File.



Do not provide “For Information Only” quantities when:

- Using contractor designed pay items, such as under Section 257 of the FP. Though the Designer may assume quantities to refine an estimate, do not provide these values to the contractor.
- When the means and methods are determined by the contractor. Common examples of this are a temporary bypass road or a work bridge.
- For common lump sum items, such as Survey and Staking or Watering for Dust Control.

6.2 Do Not Measure for Payment

When “For Information Only” work/quantities are provided, that work is not measured for payment. This is addressed in Subsection 109.05(b) of the FP which states: ***Indirect payment. Work for which direct payment is not provided is a subsidiary obligation of the Contractor. Payment of such work is indirectly included under other pay items listed in the bid schedule.*** [remaining text omitted]

However, there are instances when it is appropriate to include a ‘do not measure for payment’ SCR. The following guidance describes when it is and isn’t appropriate to write specifications ‘Do not measure x for payment’ SCRs.

1. **No Pay Item = No Payment. No SCR is required.**

If the contract requires work, and there is no pay item, then the work is not paid directly. That’s all there is to it.

Subsection 109.05(a) already says that direct payment is made when there is a pay item in the bid schedule. Adding an SCR when not necessary undermines the purpose and effect of Subsection 109.05.

2. When the bid schedule **includes a pay item, AND work is subsidiary** to another pay item, then a “Do not measure” statement MAY be necessary in the SCR’s.

This occurs rarely but is possible when components of work (such as roadway excavation, geotextile, riprap, and reinforcing steel) are involved.

For example: A project includes Pay Item 15705-0100 Silt Fence (LNFT) for installation at the toe of an embankment and Pay Item 15702-1000 Temporary Diversion Channel (LPSM). The FLH Standard Detail for Temporary Diversion Channels (157-5) requires silt fence to be installed along the diversion. Because there is a pay item for silt fence, then both installations would be paid directly. To make the silt fence subsidiary to the diversion channel, an SCR is required in Subsection 157.17 to say, “Do not measure silt fence for temporary diversion channels.”



Another example: A project includes Item 20401-0000 Roadway Excavation (CUYD) and Pay Item 15702-1000 Temporary Diversion Channel (LPSM). FP-14 Subsection 157.17 Measurement says, “Measure excavation for diversion channels and sediment basins under Section 204.” Because there is a pay item for excavation, and Section 157 says to measure excavation according to Section 204, then all such excavation is paid directly. To make the excavation subsidiary to the diversion channel, an SCR is required in Subsection 157.17 to “Delete the third paragraph.” The “do not measure” statement belongs in the Section that the pay item is located. In this case, it belongs in Section 204 and states, “Do not measure roadway excavation when performing temporary diversion channels.”

3. It is **NEVER** appropriate to include “do not measure” specifications on Plan sheets.

Plans may show “Pay Limits” for specific items (such as where a guardrail terminal section pay item ends, and the G-4 guardrail system pay item begins). However, plan notes are not a specification, so do not use the plans to revise the specifications.

6.3 Examples

The examples below describe situations where “For Information Only” quantities have been provided in the Plans.

Example 1 – Mechanically Stabilized Earth Wall

The Repair Mather Memorial Slide Area project (WA NPS MORA 12(1)) contained Section 255 MSE Walls. As shown in the table, MSE walls were measured and paid for by the square foot. To obtain a more accurate bid for the work, ‘for information only’ quantities were estimated and provided in the Plans. Note that the bid item number (Item 25501-0000) is only provided for the bid item shown in the tabulation of bid quantities and that indirect work items are labelled as “For Information Only” and contain no bid item numbers.

Table 4. Retaining Wall Example

MECHANICALLY STABILIZED EARTH WALL QUANTITIES										
LOCATION	ITEM 25501-0000 MECHANICALLY STABILIZED EARTH WALL (SQFT)	FOR INFORMATION ONLY - NOT MEASURED FOR PAYMENT								
		EXCAVATION (CUYD)	SELECT GRANULAR BACKFILL (CUYD)	CONSERVED BACKFILL (CUYD)	GABION ROCK (CUYD)	REINFORCEMENT GEOGRID, TYPE III (SQYD)	GEOTEXTILE FILTER, CLASS 2, NON WOVEN, TYPE A OR B (SQYD)	6" DIA. PERFORATED PIPE (LNFT)	6" DIA. SOLID DRAIN PIPE (LNFT)	OBJECT MARKER POST WHITE PLASTIC (EA)
506+89.90 TO 508+47.15	569	587	585	15	24	2,211	876	170	107	3
511+54.30 TO 514+37.85	1,500	1,497	1,401	30	61	5,754	1,763	300	175	5
515+14 TO 516+02.45	425	391	404	12	18	1,647	535	100	73	2
517+60.75 TO 518+08.15	239	208	210	19	10	901	287	58	87	2
519+50.38 TO 521+85.33	859	1,065	924	24	36	3,422	1,345	245	174	5
TOTAL	3,592	3,748	3,524	99	149	13,935	4,806	873	616	17



In some cases, an item listed in 'For Information Only' table will also appear as a bid item elsewhere in the Plans. Possible examples for such items from the table above are 'Excavation,' or 'Object Marker Post White Plastic.' This can cause confusion as to when this item is paid for and there is a risk that contractors may mistakenly assume the work will be paid for directly in all cases, and likewise the contractor may not cover their cost for the work listed in the 'For Information Only' table. See the "Do Not Measure for Payment" section above for additional guidance in this situation.

Example 2 – Temporary Traffic Control

Sometimes it may be necessary to explain what is reasonably expected for a lump sum bid item.

As shown in the example below, the Cape Meares Road Relocation project (OR TILLAMOOK B780(1)) used a lump sum bid item for temporary traffic control. The following 'For Information Only' Table was provided to inform the contractor of the general expectations of the work so that they can submit a more accurate bid.

Table 5. Temporary Traffic Control

INFORMATION ONLY QUANTITIES FOR ITEM NO. 63501-0000 TEMPORARY TRAFFIC CONTROL (LPSM)		
DESCRIPTION	UNIT	QUANTITY
TEMPORARY TRAFFIC CONTROL, BARRICADE TYPE 3	EACH	2
TEMPORARY TRAFFIC CONTROL, CONE	EACH	200
TEMPORARY TRAFFIC CONTROL, PORTABLE CHANGEABLE MESSAGE SIGN	EACH	2
TEMPORARY TRAFFIC CONTROL, CONSTRUCTION SIGN	SQFT	250
TEMPORARY TRAFFIC CONTROL, FLAGGER	HOUR	400

6.4 Summary

Use of individual pay items is generally preferred, when possible. However, in certain situations 'For Information Only' quantities may be added to the plans to clarify the work.

Be sure to discuss the use of 'For Information Only' quantities with the Construction CFT member, the HDM, PM, or the COE assigned to the project. The HDM, COE or Project Engineer may have a preference on how to facilitate certain items of work based on their past experiences.

