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Department of
Agriculture



Forest Service

Intermountain
Southwestern
Rocky
Mountain
Regions

Engineering



Cost Estimating Guide for Road Construction

April 2008

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Cost Estimating Guide for Road Construction

April 2008

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GENERAL INFORMATION AND INSTRUCTIONS

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Tables Of Weights And Measures

Linear Measure

1 inch		= 2.54 centimeters
12 inches	= 1 foot	= 0.3048 meter
3 feet	= 1 yard	= 0.9144 meter
5 1/2 yards or 16 1/2 feet	= 1 rod (or pole or perch)	= 5.029 meters
40 rods	= 1 furlong	= 201.17 meters
8 furlongs	= 1 (statute) mile	= 1,609.3 meters
1,760 yards	= 1 (statute) mile	= 1,609.3 meters
5,280 feet	= 1 (statute) mile	= 1,609.3 meters
3 miles	= 1 (land) league	= 4.83 kilometers

Square Measure

1 square inch		= 6.45 square centimeters
144 square inches	= 1 sq= square foot	= 929 square centimeters
9 square feet	= 1 sq= square yard	= 8361 square centimeters
30 1/4 square yards	= 1 sq= square rod (or square pole or square perch)	= 25.29 square meters
160 square rods	= 1 ac= acre	= 0.4046 hectares
4,840 sq yards	= 1 ac= acre	= 0.4046 hectares
43,560 sq ft	= 1 ac= acre	= 0.4046 hectares
640 acres	= 1 sq= square mile	= 259 hectares
640 acres	= 1 sq= square mile	= 2.59 square kilometers

Cubic Measure

1 cubic inch		= 16,387 cubic centimeters
1,728 cubic inches	= 1 cubic foot	= 0.0283 cubic meter
27 cubic feet	= 1 cubic yard	= 0.7646 cubic meter
	(in units for cordwood, etc.)	
16 cubic feet	= 1 cord foot	
8 cord feet	= 1 cord	= 3.625 cubic meters

Dry Measure

1 pint		= 33.60 cubic inches	= 0.5505 liter
2 pints	= 1 quart	= 67.20 cubic inches	= 1.1012 liters
8 quarts	= 1 peck	= 537.61 cubic inches	= 8.8096 liters
4 pecks	= 1 bushel	= 2,150.42 cubic inches	= 35.2383 liters
1 British dry quart		= 1.032 U.S. dry quart	

Liquid Measure

1 gill	= 4 fluid ounces	= 7.219 cubic inches	= 0.1183 liter
	(See next table)		
4 gills	= 1 pint	= 28.875 cubic inches	= 0.4732 liter
2 pints	= 1 quart	= 57.75 cubic inches	= 0.9463 liter
4 quarts	= 1 gallon	= 231 cubic inches	= 3.7853 liters

The British imperial gallon (4 imperial quarts) = 277.42 cubic inches = 4.546 liters. The barrel in Great Britain equals 36 imperial gallons, in the United States, usually 31 1/2 gallons.

Avoirdupois Weight

(The grain, equal to 0.0648 gram, is the same in all three tables of weight)

1 dram or 27.34 grains		= 1.772 grams
16 drams or 437.5 grains	= 1 ounce	= 28.3495 grams
16 ounces or 7,000 grains	= 1 pound	= 453.59 grams
100 pounds	= 1 hundredweight	= 45.36 kilograms
2,000 pounds	= 1 ton	= 907.18 kilograms

In Great Britain, 14 pounds (6.35 kilograms) = 1 stone, 112 pounds (50.80 kilograms) = 1 hundred weight, and 2,240 pounds (1,016.05 kilograms) = 1 long ton.

The Metric System

Linear Measure

10 millimeter	= 1 centimeter	= 0.3937 inch
10 centimeters	= 1 decimeter	= 3.937 inches
10 decimeters	= 1 meter	= 39.37 inches
10 decimeters	= 1 meter	= 3.28 feet
10 meters	= 1 decameter	= 393.7 inches
10 decameters	= 1 hectometer	= 328 feet 1 inch
10 hectometers	= 1 kilometer	= 0.621 mile
10 kilometers	= 1 myriameter	= 6.21 miles

Square Measure

100 square millimeters	= 1 square centimeter	= 0.15499 square inch
100 square centimeters	= 1 square decimeter	= 15.499 square inches
100 square decimeters	= 1 square meter	= 1,549.9 square inches
100 square decimeters	= 1 square meter	= 1.196 square yards
100 square meters	= 1 square decameter	= 119.6 square yards
100 square decameters	= 1 square hectometer	= 2.471 acres
100 square hectometers	= 1 square kilometer	= 0.386 square mile

Land Measure

1 square meter	= 1 centiare	= 1,549.9 square inches
100 centiares	= 1 are	= 119.6 square yards
100 ares	= 1 hectare	= 2.471 acres
100 hectares	= 1 square kilometer	= 0.386 square mile

Volume Measure

1,000 cubic millimeters	= 1 cubic centimeter	= .06102 cubic inch
1,000 cubic centimeters	= 1 cubic decimeter	= 61.02 cubic inches
1,000 cubic decimeters	= 1 cubic meter	= 35.314 cubic feet

Weights

10 kilograms	= 1 myriagram	= 22.046 pounds
10 myriagrams	= 1 quintal	= 220.46 pounds
10 quintals	= 1 metric ton	= 2,204.6 pounds

General Information and Instructions

Significant changes in the 2008 Cost Guide:

Equipment rates were updated in 2008. Equipment types tracked were changed to include three new classes of equipment:

- Hand Held Compactors (both vibratory plate and jumping jack types)
- Skid Steer Loaders
- Mini-excavators

Labor rates were updated in 2008. Labor rates tables were changed to include one new class:
Roller Operator – Compaction

Construction material prices were NOT updated as part of the 2008 revisions to the Cost Guide. Construction Materials Supplier contact information was verified and updated and one new supplier class was added for bentonite suppliers.

Unit costs were NOT updated as part of the 2008 revisions to the Cost Guide. It is suggested that estimators take into account inflation factors and local cost increases utilizing a simple multiplier, it suggested that at a minimum, the multiplier be:

Adjusted Annual Consumer Price Index (CPI) + 2% = Annual Multiplier

Current CPI is available online from the US Bureau of Labor Statistics at:
www.bls.gov/news.release/cpi.toc.htm

Additional factors such as local increases in fuel costs, transportation/freight costs, local labor or materials shortages, etc. should be included in any calculations to adjust unit costs.

The unit costs published in the Guide were developed using Idaho Zone 1 wage rates and equipment rates. The Davis-Bacon wage rate adjustments must be applied to all unit costs published in the Guide if the project is outside Idaho Zone 1.

In addition, an adjustment factor table to compensate for differences in equipment hourly rates appears in the Engineer's Estimate section. For projects in Colorado, Idaho, Kansas, Nebraska, or Nevada no adjustment is necessary. See Table 4 in the Engineer's Estimate section.

1. Revisions and Updates. There is one annual revision of the Cost Guide that is typically published in February.

The Forest Service has adopted the FP-03 (Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects). This has resulted in a major change in the cost guide and required a set of FSSS (Forest Service Supplemental Specifications) so that the specifications will conform to the Forest Service contract requirements. As a result the

descriptions of the specification items have changed for some of the items and many of the specification numbers have changed. The items have also been rearranged. However, the content of the information in this cost guide has changed very little except for the updated costs. The FP-03 and FSSS are available in either Metric or US Customary (English) units. Verify that cost estimates allow for all work required by the various FSSS in the contract. Since the FSSS are being modified over time, unit costs shown in this guide may not accurately reflect the work required.

2. Time and Equipment (Construction) Estimates. On some items, it may be necessary to develop estimates by "time and equipment." When making time and equipment estimates, be sure to include allowances for:

A. Supervision. On very small jobs this may be provided by an operator/supervisor at essentially no additional cost.

B. Taxes on purchase of material. Also, allow for delivery cost to job site.

C. Bonding cost (may be included in Section 151 Mobilization).

D. Stand By Time. "Standby time" for equipment and operators that are part of a "spread" performing a segment of work, but who are not working at full capacity all the time, averages 2 to 2 1/2 percent of the total contract cost. For example, during placement of aggregate, a grader, roller and water truck are needed. The grader and roller may be operating full time; the water truck only part time. The estimate should include standby time for the water truck to compensate for having it available on the job during the entire time of placing aggregate.

E. Support Equipment. Fuel trucks, pickups, crew transportation, etc.

F. Permits.

Please note that the labor and equipment rates shown in the Cost Guide include applicable "payroll loading" and profit and overhead costs.

3. Unit Costs. The estimator should round off the unit price to avoid creating accounting errors when processing contract payments. For example, clearing costs generally should be rounded to the nearest \$10 per acre, excavation costs should be rounded to the nearest \$.10 per CY, and CMP costs are rounded to \$.50/LF. Quantities should never be carried out further than the nearest one-hundredth (0.01), and generally no further than the nearest one-tenth (0.1), depending on accuracy of measurements and cost or value of the item.

4. Use of Average Cost in Project. Use average cost for individual roads within the project whenever possible unless there are significant variations in the character of work from one road to another. Variations are sometimes appropriate for clearing, excavation, hauling, or other unique situations. In these situations, each road should have separate and distinct unit costs for

those items; otherwise, the use of overall project unit costs may create problems with design changes, alternate facilities, etc.

5. Profit and Risk Factor. The profit and risk factor used in this Cost Guide is 10 percent. All unit prices shown in the Guide include this allowance, including the wage and equipment rates.

6. Section Number. The Specifications are referred to by Section Numbers in FP-03. The Section Numbers are further broken down by paragraphs with decimal points (i.e. 213.08). Supplemental Specifications are referred to as Forest Service Supplemental Specifications (FSSS). The FSSS's replace or modify the parent specification.

7. Pay Item Number. Pay item numbers and descriptions are found in the Spec Manager database in Lotus Notes rather than in the FP-03 book.

8. Public Works & Timber Sale Estimates. All engineer's estimates for road construction are to be prepared as if construction is to be accomplished by a public works contract. Unit costs for work items listed in this cost guide utilize Davis-Bacon wages.

9. Davis-Bacon (D-B) /Purchaser Wage Rate Adjustments. To arrive at Specified Road Construction Cost, the engineer's cost estimate shall be adjusted by the estimated cost difference between the applicable Davis-Bacon wage rates and the local prevailing wage rates using the appropriate labor factor given for the labor percentages shown for each work item. These adjustments are mandatory and will be used for all timber sale contracts having specified road construction. Note that some work items are not normally performed by a Timber Sale Purchaser but are subcontracted. No reduction should be made for these items, if the subcontractor is likely to pay Davis-Bacon wage rates. Reductions will be made for those situations where it is unlikely that D-B wages are paid. Refer to FSH 7709.56-7.54 (Preconstruction Handbook) for more information, and refer to Labor Rates in the Engineer's Estimate section of this Guide for D-B wage information. An example of this may be dust palliative treatments. For additional information, see section entitled Davis-Bacon/Purchaser Wage Rate Adjustments.

10. Fuel Prices. Fuel costs can be quite variable over a period of time due to geopolitical conditions. Equipment Rates in Section 622 and elsewhere in this Guide may need to be adjusted by the estimator to compensate for these variations. Other machinery/equipment that uses fuel or propane such as asphalt plant dryers, generators, etc. may also cost more/less to operate. The overall effect on the typical road construction project is that 30-40% fuel price increases will increase the total cost of construction about 2-5%. The estimator should be aware of big (10% plus) fuel price increases/decreases that would affect the unit bid prices shown in this Guide. Fuel price variations will have more effect on items that are equipment oriented such as excavation, than those that are material and labor oriented such as signs.

11. Use of Costs Other Than Shown in the Cost Guide. When local experience indicates unit costs are different than those shown in this Guide, local costs should be

considered. Cost deviations from this Guide shall be documented and included in the project file.

12. Small Quantity Adjustments. Estimates should consider all roads that are included in a contract package that are within a five mile radius as one project for the purposes of small quantity adjustments. Therefore, small quantity factors should not be applied to individual road costs when the individual roads are part of a larger group of road projects in the same vicinity and part of the same contract. On the other hand, where small quantities are involved, estimators should increase allowances due to the inefficiencies generally encountered in small projects. Of particular concern are projects where small quantities of aggregate are involved. Mobilization of equipment may outweigh the direct costs of the aggregate, short road construction projects also have a relatively high mobilization cost for transport of dozers and excavators.

13. Purchaser Engineering. Recent changes in Forest Service FRP budgets have introduced or revised several concepts for timber sale roads: post-award engineering (PAE) including possible purchaser survey and/or design, restricted public use of haul routes, deposits for engineering work on road reconstruction, converting some planned short-term specified roads to temporary roads that remain open for a short period after purchasers use, and use of salvage sale funding for engineering work. Estimator should refer to specific C-provision requirements when estimating purchaser engineering costs.

14. Change Orders & Design Changes. The principles, costs, etc. listed in this Guide can be used to assist in determining unit costs for contract design changes and change orders; however, site specific and project related information should be used to the maximum extent possible.

15. New FP-03 Specifications. All costs in this guide are associated with the FP-03 and FSSS specifications. Many of the items in the new Specifications have changed and users of this guide should verify that the costs are associated with the same or correct type of work.

16. Electronic Copy of the Cost Guide. This cost guide can be found on the intranet at <http://fsweb.r4.fs.fed.us/>. Click on STAFFS, then ENGINEERING under the RESOURCES Staff, then TRANSPORTATION, and PLANNING and DEVELOPMENT. Click on the 2008 R2/R3/R4 Cost Guide link to download the complete guide.

The cost guide is available for downloading by the general public at: www.fs.fed.us/r4/, click on Projects & Plans, then on the Cost Estimating Guide link to download.

The cost guide will be updated whenever new data is available or as corrections are needed. The annual update takes place in February of each year.

17. Summary. This is a guide and not a cookbook. Estimators need to use judgment and knowledge of the specific project and local conditions when preparing cost estimates.

General Information

Others sources for cost estimation procedures and data (use the most current version available):

RS Means Heavy Construction Cost Data

Equipment Watch Rental Rate Blue Book for Construction Equipment

Caterpillar Handbook – for production rates and equipment capabilities

End of General Information

ENGINEER'S ESTIMATE

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Engineer's Estimate

The preliminary estimated unit costs published in this guide may need to be adjusted. Determine the area and/or zone and adjust the unit costs per instructions of this section. All unit costs in this guide were calculated using Idaho Zone1 hourly wage rates and Idaho hourly equipment rates. Due to the differences in Davis-Bacon wage rates across the 3 Regions, and variances in equipment rates, cost adjustments may be needed.

Current Davis-Bacon wage rates may be downloaded at <http://www.gpo.gov/davisbacon/> .

1. Determination of Wage Rate Area/Zone

A. ARIZONA

In Arizona, Davis-Bacon wage rates published in this guide apply to the entire state.

B. CALIFORNIA

In California, Davis-Bacon wage rates published in this guide apply to all the counties contained within Region 4.

C. COLORADO

In Colorado, Davis-Bacon wage rates published in this guide are divided into 2 Zones.

Zone 1 includes the following counties: Alamosa, Archuleta, Baca, Bent, Chaffee, Cheyenne, Clear Creek, Conejos, Costilla, Crowley, Custer, Delta, Dolores, Eagle, Elbert, Fremont, Garfield, Gilpin, Grand, Gunnison, Hinsdale, Huerfano, Jackson, Kiowa, Kit Carson, La Plata, Lake, Las Animas, Lincoln, Logan, Mineral, Moffat, Montezuma, Montrose, Morgan, Otero, Ouray, Park, Phillips, Pitkin, Prowers, Rio Blanco, Rio Grande, Routt, Saguache, San Juan, San Miguel, Sedgwick, Summit, Teller, Washington and Yuma counties.

Zone 2 includes the following counties: Adams, Arapahoe, Boulder, Denver, Douglas, El Paso, Jefferson, Larimer, Mesa, Pueblo and Weld counties.

D. IDAHO

In Idaho, Davis-Bacon wage rates published in this guide are divided into 2 Zones within Region 4 as described below.

Zone 1: That area within the State of Idaho located within 30 miles on either side of I-84 from the Oregon-Idaho State Line on the West to the Intersection of I-84 and I-86 in Cassia County, then following I-86 to Pocatello, then following I-15 to Idaho Falls, then following State Highway #20 - 10 miles north to the intersection with Moody Road then following I-15 south from the city of Pocatello to a point 10 miles South of the Southern Boundary of Bannock County extended to the West.

Zone 2: The remaining area of that portion of the State of Idaho south of Parallel 46 (the Washington-Oregon State Line extended eastward to Montana) that is not included in Zone 1 as described above. An additional \$1.50 per hour was added to the Zone 1 base wage rates, before adding in fringes and adjustments for overhead and profit and risk.

E. KANSAS

In Kansas, Davis-Bacon wage rates published in this guide apply to all the counties contained within Region 2 administered land.

F. NEBRASKA

In Nebraska, Davis-Bacon wage rates published in this guide apply to all the counties contained within Region 2 administered land.

G. NEVADA

In Nevada, Davis-Bacon wage rates published in this guide are divided into 2 Zones, Las Vegas and Carson City. Special hourly rate adjustments apply depending upon the distance from the project to the reference point of the zone.

Las Vegas Zone: Includes the following counties: Clark, Esmeralda, Lincoln, and Nye counties.

Carson City Zone: Includes the following counties: Churchill, Douglas, Elko, Eureka, Humboldt, Lander, Lyon, Mineral, Pershing, Storey, Washoe, White Pine, and Carson City counties.

Nevada area pay applies to all three categories in Las Vegas area and in the Carson City area. Add the appropriate adjustments to wage rates when work falls within the listed areas. The rates adjustments required by the Nevada Wage Determination were modified to include overhead costs and profit and risk.

Adjustments for Las Vegas Zone - Mileage is road miles from City Hall, Las Vegas

	Las Vegas	Power Equip	Las Vegas	Labor	Las Vegas	Truck Driver
Area 1	0 - 20 miles		0 - 30 miles		0 - 30 miles	
Area 2	20 - 40 miles	\$2.25	30-50 miles	\$0.00	30-50 miles	\$2.25
Area 3	40 - 60 miles	\$3.75	50 - 70 miles	\$0.00	50 - 70 miles	\$3.75
Area 4	> 60 miles	\$4.50	> 70 miles	\$0.00	> 70 miles	\$5.24

Adjustments for Carson City Zone - Mileage is road miles from the County Courthouse in Washoe County

	Carson City	Power Equip/Truck Driver	Labor
Area 1	0 - 50 miles		
Area 2	50 - 150 miles	\$3.00	\$0.00
Area 3	150 - 300 miles	\$4.50	\$0.00
Area 4	> 300 miles	\$5.99	\$0.00

H. NEW MEXICO

In New Mexico, Davis-Bacon wage rates published in this guide are divided into 2 Zones.

Zone 1 includes the following counties: Bernalillo, Los Alamos, Dona Ana, and Sante Fe counties

Zone 2 includes the following counties: Catron, Hidalgo, San Juan, Chaves, Cibola, Colfax, Curry, De Baca, Eddy, Grant, Guadalupe, Harding, Lea, Lincoln, Luna, McKinley, Mora, Otero, Quay, Rio Arriba, Roosevelt, San Miguel, Sandoval, Sierra, Socorro, Taos, Torrance, Union, and Valencia counties.

I. SOUTH DAKOTA

In South Dakota, Davis-Bacon wage rates published in this guide are divided into 2 Zones.

Zone 1 includes the following counties: Lincoln, Minnehaha and Pennington counties

Zone 2 includes the following counties: Aurora, Beadle, Bennett, Bon Homme, Brookings, Brown, Brule, Buffalo, Butte, Campbell, Charles Mix, Clark, Clay, Codington, Corson, Custer, Davison, Day, Deuel, Dewey, Douglas, Edmunds, Fall River, Faulk, Grant, Gregory, Haakon, Hamlin, Hand, Hanson, Harding, Hughes, Hutchinson, Hyde, Jackson, Jerauld, Jones, Kingsbury, Lake, Lawrence, Lyman, Marshall, McCook, McPherson, Meade, Mellette, Miner, Moody, Perkins, Potter, Roberts, Sanborn, Shannon, Spink, Stanley, Sully, Todd, Tripp, Turner, Union, Walworth, Yankton and Ziebach counties.

J. UTAH

In Utah, Davis-Bacon wage rates published in this guide are divided into 2 Zones.

Zone 1 includes the following counties: Davis, Juab, Millard, Morgan, Salt Lake, Sanpete, Sevier, Summit, Utah, and Weber counties.

Zone 2 includes the following counties: Beaver, Box Elder, Cache, Carbon, Daggett, Duchesne, Emery, Uintah, Garfield, Grand, Iron, Kane, Piute, Rich, San Juan, Tooele, Wasatch, Washington and Wayne counties.

K. WYOMING

In Wyoming, Davis-Bacon wage rates published in this guide are divided into 2 Zones.

Engineer's Estimate

Zone 1 includes the following counties: Albany, Big Horn, Campbell, Carbon, Converse, Crook, Fremont, Goshen, Hot Springs, Johnson, Lincoln, Niobrara, Park, Platte, Sheridan, Sublette, Sweetwater, Teton, Uinta, Washakie and Weston counties.

Zone 2 includes the following county: Natrona county.

The wage rates shown in Tables 1 and 2 below include basic hourly rates; fringe benefits; an overhead factor to cover Worker’s Compensation and Unemployment Insurance costs which varies by state, Social Security Taxes (7.65%), Risk Insurance and Public Liability costs (2.02%), Overhead costs (16%); and 10% profit and risk. Wage rates are subject to change at any time. The zone contracting specialists can provide the latest wage information.

The Equipment Size Classification tables are used when certain wage zones within individual states require paying different wage rates based on size of equipment being operated. This only applies to dozers, front end loaders, and trucks. Where there is no difference in rates, “same” appears in the table.

TABLE 1 – HOURLY WAGE RATES

JOB CLASSIFICATION	AZ	CA	CO		ID		KS	NE	NV	
ZONE			1	2	1	2			LV	CAR-SON CITY
Foreman	44.44	78.84	43.87	45.46	45.73	47.91	23.89	23.84	71.06	63.33
General Laborer	25.69	49.97	22.15	28.63	39.75	41.93	13.76	13.06	50.89	38.71
Chainsaw Operator	26.05	52.97	25.98	29.69	40.26	42.44	15.20	17.63	51.28	39.09
Powderman	28.71	52.97	40.88	40.65	40.04	42.23	17.74	18.26	51.48	39.46
Wagon Drill Operator	40.02	69.43	40.88	41.10	43.55	45.74	17.01	18.26	51.35	39.09
Asphalt Spreader Operator	41.57	67.40	40.65	40.65	43.06	45.24	19.55	19.44	62.10	56.12
Backhoe Operator	40.80	69.51	29.00	29.00	43.42	45.61	18.10	15.50	66.45	57.48
Dozer Operator (1)	35.33	71.38	40.65	40.65	43.51	45.69	18.10	18.26	66.95	56.23
Dozer Operator (2)	40.02	71.38	40.65	40.65	43.51	45.69	18.10	20.15	66.95	58.55
Front End Loader Operator (1)	40.02	71.38	40.65	40.65	43.06	45.24	18.10	17.94	66.45	58.01
Front End Loader Operator (2)	41.57	73.50	40.88	40.88	43.31	45.49	18.10	19.04	67.13	58.65
Grader Operator	41.57	75.77	28.73	40.88	43.51	45.69	19.55	18.93	67.10	58.29
Heavy Duty Mechanic/Welder	35.56	71.38	29.25	41.10	43.51	45.69	21.00	20.38	68.60	57.48
Hydraulic Excavator Operator	41.57	75.77	40.88	40.88	44.09	46.28	19.55	19.75	67.38	61.11
Truck Driver (1)	31.94	56.92	25.01	27.62	41.13	43.31	17.38	15.19	54.29	34.67
Truck Driver (2)	32.83	57.38	25.01	28.12	41.39	43.57	18.10	17.08	55.26	40.48
Roller Operator Compaction	35.33	68.31	40.65	40.65	42.61	44.79	17.38	15.19	54.29	34.67

Equipment Size Classifications for TABLE 1

EQUIPMENT	AZ	CA	CO	ID	KS	NE	LV----	NV ----	CC
Dozer (1)	<D5	same	same	same	same	<D5	<D5		same
Dozer (2)	>=D5	same	same	same	same	>=D5	>=D5		same
Front End Loader (1)	3-6 CY	<= 4 CY	<= 6 CY	< 4 CY	same	<= 4 CY	< 1.5 CY		< 1.5 CY
Front End Loader (2)	7-10 CY	>4 CY	> 6 CY	4 - 7 CY	same	>4 CY	1.5 – 6 CY		1.5 – 6 CY
Truck (1)	<=4 axle	<= 8 CY	<= 14 CY	< 16 CY	<4 axle	<4 axle	< 12 CY		< 12 CY
Truck (2)	>5 axle	> 8 CY	>14 CY	16 – 30 CY	>3 axle	>3 axle	12 –16 CY		12 –16 CY

TABLE 2 – HOURLY WAGE RATES

JOB CLASSIFICATION	NM		SD		UT		WY	
	1	2	1	2	1	2	1	2
Foreman	16.59	16.93	33.15	33.09	46.96	42.12	36.74	36.19
General Laborer	9.23	9.76	19.80	19.77	20.59	21.30	20.75	18.58
Chainsaw Operator	9.23	10.29	21.33	21.30	21.74	22.21	23.75	21.65
Powderman	9.23	10.29	24.45	24.54	22.19	23.78	23.75	21.65
Wagon Drill Operator	9.06	10.29	24.45	24.54	30.38	43.02	32.03	31.69
Asphalt Spreader Operator	13.38	13.71	27.45	27.45	31.19	35.99	32.03	31.69
Backhoe Operator	13.38	13.71	26.70	26.22	33.18	34.81	29.66	30.56
Dozer Operator (1)	12.46	12.80	24.45	24.54	36.85	36.56	27.26	31.03
Dozer Operator (2)	13.38	13.71	26.70	26.22	40.60	38.38	32.03	31.69
Front End Loader Operator (1)	12.46	12.80	24.45	24.54	34.80	37.42	27.26	31.03
Front End Loader Operator (2)	13.38	13.71	26.70	26.22	38.60	38.16	32.03	31.69
Grader Operator	13.38	13.71	28.39	28.13	42.13	37.06	32.03	31.69
Heavy Duty Mechanic/Welder	13.60	13.94	30.09	30.03	39.63	36.40	33.74	33.19
Hydraulic Excavator Operator	13.60	13.94	30.09	30.03	34.91	35.03	32.03	31.69
Truck Driver (1)	10.51	10.81	20.91	21.05	27.57	29.19	26.68	27.26
Truck Driver (2)	10.81	11.11	24.59	24.75	30.88	30.26	28.49	26.59
Roller Operator Compaction	12.46	12.46	24.45	24.54	29.75	30.36	27.26	31.03

Equipment Size Classifications for TABLE 2

EQUIPMENT	NM	SD	UT	WY
Dozer (1)	< D4	< D4	<= D7	< D4
Dozer (2)	D4 and up	D4 and up	> D7	D4 and up
Front End Loader (1)	< 2 CY	< 1.25 CY	<= 10 CY	< 1.5 CY
Front End Loader (2)	2 – 10 CY	>= 1.25CY	> 10 CY	1.5 – 3.5 CY
Truck (1)	8 – 16 CY	<4 axle	<= 8 CY	< 7 CY
Truck (2)	> 16 CY	>3 axle	8 – 14 CY	7 – 13 CY

2. Adjustment factors for the Unit Costs

Adjust the preliminary estimated unit prices in this guide by multiplying them by the appropriate factors in the following Tables 3 and 4.

The wage rate adjustment factors in Table 3 are based on the appropriate Davis Bacon wage rates with fringes and overhead loading for a mixed work force of equipment operators, laborers, and truck drivers.

TABLE 3 – UNIT COST ADJUSTMENT FACTORS FOR PUBLIC WORKS DAVIS-BACON ZONES

LABOR %	ARIZONA - all COLORADO - Zone 2	CALIFORNIA - all LAS VEGAS Area > 30 miles	COLORADO - Zone 1 UTAH - all	IDAHO - Zone 2	KANSAS -all NEBRASKA - all	LAS VEGAS Area 0-30 miles	CARSON Area <50 miles	CARSON Area 50-300 miles	CARSON Area >300 miles	NEW MEXICO - all	SOUTH DAKOTA - all	WYOMING - Zone 1	WYOMING - Zone 2
5	0.99	1.03	0.99	1.00	0.97	1.02	1.01	1.02	1.02	0.97	0.98	0.98	0.99
10	0.99	1.05	0.98	1.01	0.95	1.05	1.03	1.03	1.04	0.93	0.96	0.97	0.97
15	0.98	1.08	0.97	1.01	0.92	1.07	1.04	1.05	1.06	0.9	0.94	0.95	0.96
20	0.97	1.11	0.96	1.01	0.89	1.10	1.06	1.07	1.07	0.86	0.93	0.93	0.94
25	0.97	1.14	0.96	1.01	0.86	1.12	1.07	1.09	1.09	0.83	0.91	0.92	0.93
30	0.96	1.16	0.95	1.02	0.84	1.14	1.08	1.10	1.11	0.79	0.89	0.90	0.91
35	0.95	1.19	0.94	1.02	0.81	1.17	1.10	1.12	1.13	0.76	0.87	0.88	0.90
40	0.95	1.22	0.93	1.02	0.78	1.19	1.11	1.14	1.15	0.72	0.85	0.87	0.88
45	0.94	1.24	0.92	1.02	0.75	1.22	1.13	1.15	1.17	0.69	0.83	0.85	0.87
50	0.94	1.27	0.91	1.03	0.73	1.24	1.14	1.17	1.19	0.65	0.82	0.84	0.85
55	0.93	1.30	0.90	1.03	0.70	1.26	1.15	1.19	1.20	0.62	0.80	0.82	0.84
60	0.92	1.32	0.89	1.03	0.67	1.29	1.17	1.20	1.22	0.58	0.78	0.80	0.82
65	0.92	1.35	0.88	1.03	0.64	1.31	1.18	1.22	1.24	0.55	0.76	0.79	0.81
70	0.91	1.38	0.87	1.04	0.62	1.34	1.20	1.24	1.26	0.51	0.74	0.77	0.79
75	0.90	1.41	0.87	1.04	0.59	1.36	1.21	1.26	1.28	0.48	0.72	0.75	0.78
80	0.9	1.43	0.86	1.04	0.56	1.38	1.22	1.27	1.30	0.44	0.70	0.74	0.76
85	0.89	1.46	0.85	1.04	0.53	1.41	1.24	1.29	1.31	0.41	0.69	0.72	0.75
90	0.88	1.49	0.84	1.05	0.51	1.43	1.25	1.31	1.33	0.37	0.67	0.70	0.73
95	0.88	1.51	0.83	1.05	0.48	1.46	1.27	1.32	1.35	0.34	0.65	0.69	0.72
100	0.87	1.54	0.82	1.05	0.45	1.48	1.28	1.34	1.37	0.30	0.63	0.67	0.70

The equipment rate factors in Table 4 are used to adjust for regional cost differences listed in the Equipment Watch Rental Rate Blue Book.

TABLE 4 – UNIT COST ADJUSTMENT FACTORS FOR EQUIPMENT RATE DIFFERENCES

No adjustment is necessary for Colorado, Idaho, Kansas, Nebraska, or Nevada

% LABOR	AZ, NM, UT	CA, SD, WY
	0.97	1.05
5	0.97	1.05
10	0.97	1.05
15	0.97	1.04
20	0.98	1.04
25	0.98	1.04
30	0.98	1.04
35	0.98	1.03
40	0.98	1.03
45	0.98	1.03
50	0.99	1.03
55	0.99	1.02
60	0.99	1.02
65	0.99	1.02
70	0.99	1.02
75	0.99	1.01
80	0.99	1.01
85	1	1.01
90	1	1.01
95	1	1
100	1	1

3. Examples

Example No. 1:

New Mexico

For Item 60250 - 18" culvert (new construction)

Percent labor = 25%

Cost Guide unit cost = \$24.00/LF

Adjusted Davis-Bacon cost = CG unit cost x D-B adjust factor x equipment adjust factor
= \$24.00 x 0.83 x 0.98 = \$19.50/LF

Example No. 2:

California

For Item 60250 - 18" culvert

Percent Labor = 35%

Cost Guide unit cost = \$24.00/lf

Adjusted Davis-Bacon cost = \$24.00 x 1.19 x 1.03 = \$29.40/LF

End of Engineer's Estimate

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DAVIS-BACON/PURCHASER WAGE RATE ADJUSTMENTS

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Davis-Bacon/Purchaser Wage Rate Adjustments

All road construction projects must first be estimated as if being built by public works contracts using Davis-Bacon wage rates. For Timber Sale Contracts, the engineer's estimate must then be adjusted to take into account the difference between Davis-Bacon wage rates and the local wage rates paid by timber purchasers. This adjusted construction cost is called the Total Estimated Road Construction Cost. The method to use for the cost adjustment is explained below.

The following labor percentage ranges shown in Tables 1 and 2 are typical and include equipment operators, truck drivers and laborers. The actual percentage selected should be documented. Use of percentages different than those indicated and the reason for the selection should also be documented.

TABLE 1

Work Item	Percent Labor	Low Percent Factors	High Percent Factors
151-Mobilization	33-62	Short travel distance with few pieces of equipment to dismantle and reassemble.	Long travel distance, many pieces of equipment to move, dismantling and assembly of equipment, semi-permanent structures, platforms, etc., to erect for project support
201-Clearing and Grubbing	41-56	Small timber, light ground cover, gentle terrain, good soils, scattering, accessible to equipment.	Large timber, heavy ground area, difficult terrain, poor soils and rock, pile and burn, inaccessible to equipment.
204-Excavation and Embankment This item may be broken down as follows: Movement Dirt Slope, Rounding, and Benching Compaction Scarification Drill and Blast Traffic Control Station-Yard Overhaul Yd3-mile Overhaul	25-45 24 25 30 45 86 90 23 37	Gentle terrain, good soils, wide poor soils and tolerances, no blasting	Difficult terrain, rock, close tolerance, blasting, and haul.
209-Structure Excavation and Backfill	35-45	Gentle terrain, good soils, easy equipment access, no dewatering.	Difficult terrain, poor soils and rock, equipment access difficult, dewatering required.

TABLE 2

Work Item	Percent Labor	Low Percent Factors	High Percent Factors
251-Riprap Hand-Placed Machine-Placed Sacked Wire-Enclosed	45 20 60 75		
253-Gabions	25-35		
303-Road Reconditioning	50		
322-Minor Aggregate Course	25-45	Crushed pit rock, wide gradation tolerance	Crushed quarry rock, close gradation tolerance.
400-Asphalt Pavement	20-30	Large project, road mix, wide tolerance	Small project, plant mix, close tolerance, labor intensive.
550-Bridge Construction	20-30	No reduction if purchaser is not equipped to perform. Requires analysis of equipment, labor, and materials	
602-Culverts and drains	45-60	Gentle terrain, easily available bedding and backfill material.	Steep pipe grade, poor gradation for bedding and backfill material.
605-Underdrains (Installation Only) Backfill Filter Cloth Special Granular Backfill	90 10 10 25		
606-Corrugated Spillways Installation Only	20 80		
619-Fences, Gates and Cattleguards Metal gates and cattlequards Fence and wire gates	10-15 60		
625-Turf Establishment	35-70	Hydromulch, flat slopes, large project.	Hand-placed mulch, steep slopes, small project.

The amount of labor involved in work items not shown above must be determined by analysis of labor, materials, and equipment for the item.

See individual items in text of Cost Guide for other labor percentages. Note that contract items (items not normally accomplished by woods crews such as engineering and asphalt items) are not to be reduced, if the subcontractor is expected to pay Davis-Bacon wage rates. See Labor Rates in the Engineer's Estimate section of this Guide for Davis-Bacon wage rate information.

Table 3 below is just for reference and lists the reduction percentages to be applied to the labor costs for each work item based on the state where the project is located. Table 4 on the following page provides the unit costs adjustment factors to apply to the Engineer's Estimate (Davis-Bacon wages) unit costs based on the percent labor involved and the work zone. An example calculation follows the table.

TABLE 3

State	Reduction	State	Reduction	State	Reduction
Arizona	No Adjustment	Kansas	No Adjustment	South Dakota	No Adjustment
California	No Adjustment	Nebraska	No Adjustment	Utah	63 Percent
Colorado	25 Percent	Nevada	No Adjustment	Wyoming	No Adjustment
Idaho	45 Percent	New Mexico	No Adjustment		

Davis-Bacon/Purchaser Wage Rate Adjustment

To determine the Estimated Road Construction Cost allowance for any item, the following procedure must be followed:

1. Determine the Davis Bacon wage rate area and/or zone. For instructions, see the previous section of this guide, Engineer's Estimate.
2. Determine labor percentage for applicable item in the body of this Guide or from the table on the previous page.
3. Select the appropriate unit cost adjustment factor from Table 4 on the next page.

TABLE 4 - PURCHASER UNIT COST ADJUSTMENT FACTOR FOR WAGE DIFFERENTIALS

LABOR %	AZ	CA	CO	ID	KS	NE	NV	NM	SD	UT	WY
5	1.00	1.00	0.99	0.98	1.00	1.00	1.00	1.00	1.00	0.97	1.00
10	1.00	1.00	0.98	0.96	1.00	1.00	1.00	1.00	1.00	0.94	1.00
15	1.00	1.00	0.96	0.93	1.00	1.00	1.00	1.00	1.00	0.91	1.00
20	1.00	1.00	0.95	0.91	1.00	1.00	1.00	1.00	1.00	0.87	1.00
25	1.00	1.00	0.94	0.89	1.00	1.00	1.00	1.00	1.00	0.84	1.00
30	1.00	1.00	0.93	0.87	1.00	1.00	1.00	1.00	1.00	0.81	1.00
35	1.00	1.00	0.91	0.84	1.00	1.00	1.00	1.00	1.00	0.78	1.00
40	1.00	1.00	0.90	0.82	1.00	1.00	1.00	1.00	1.00	0.75	1.00
45	1.00	1.00	0.89	0.80	1.00	1.00	1.00	1.00	1.00	0.72	1.00
50	1.00	1.00	0.88	0.78	1.00	1.00	1.00	1.00	1.00	0.69	1.00
55	1.00	1.00	0.86	0.75	1.00	1.00	1.00	1.00	1.00	0.65	1.00
60	1.00	1.00	0.85	0.73	1.00	1.00	1.00	1.00	1.00	0.62	1.00
65	1.00	1.00	0.84	0.71	1.00	1.00	1.00	1.00	1.00	0.59	1.00
70	1.00	1.00	0.83	0.69	1.00	1.00	1.00	1.00	1.00	0.56	1.00
75	1.00	1.00	0.81	0.66	1.00	1.00	1.00	1.00	1.00	0.53	1.00
80	1.00	1.00	0.80	0.64	1.00	1.00	1.00	1.00	1.00	0.50	1.00
85	1.00	1.00	0.79	0.62	1.00	1.00	1.00	1.00	1.00	0.46	1.00
90	1.00	1.00	0.78	0.60	1.00	1.00	1.00	1.00	1.00	0.43	1.00
95	1.00	1.00	0.76	0.57	1.00	1.00	1.00	1.00	1.00	0.40	1.00
100	1.00	1.00	0.75	0.55	1.00	1.00	1.00	1.00	1.00	0.37	1.00

Determine Estimated Road Construction Cost for applicable item by multiplying the public works cost by the labor factor determined in No. 3.

Example:
 Public works excavation cost = \$1.75/cy
 Project location: Idaho
 Excavation: labor percentage (from Table 1) = 25 percent
 Unit cost adjustment factor (from Table 4) = 0.89
 Estimated road construction cost = \$1.75 * 0.89 = \$1.56/cy

Time Estimates For Road Construction Projects

Care must be exercised when determining time estimates. The final time estimate should not be made until all contract clauses are known, including applicable C provisions for timber sale contracts. Be sure to consider operating season limitations. Project access and sequencing must also be considered.

Except in unusual circumstances, the time estimate should not exceed two (2) full construction seasons. This may require increasing the size of the crew and the amount of equipment used in the estimate. In addition, this may require the adjustment of some cost items and contract clauses. For projects that will require more than one construction season to complete, be sure to allow for the cost of the mobilization of equipment and personnel for each operating season.

When the construction of specified roads in a timber sale contract can be turned back to the Forest Service, consider the effect on the road completion date. Allow sufficient time for the Forest Service to prepare a public works contract, receive a satisfactory bid, and have the road construction work completed by the "Road Completion Date" stated in the Timber Sale Contract. A minimum of 150 days should be allowed to prepare, solicit, and award a Public Works contract.

Whenever the Total Estimated Road Construction Cost for a timber sale is \$50,000 or more, consider the possibility of a turnback. Use the following form to track the various time components associated with a turnback and to determine if the proposed road completion date to be included in the timber sale contract is attainable.

Time Estimating And Scheduling

Road completion date will be set by determining the timber sale advertisement date and adding the following:

Timber Sale (T.S.) Advertisement Date	_____
1. Sale Advertising Period Timber Sale Bid Opening Date	30 Days _____
2. Period specified in the T.S. advertisement to allow the F.S. to solicit and award a P.W. Contract for the road construction. (150 days minimum is recommended. See note below)	* 150 Days
Public Works Construction Award Date	_____
3. Additional time needed between P.W. contract award date and date construction could start.	10 Days
Public Works Construction Start Date	_____
4. Total calendar days elapsed time allowed for completion of road construction Public Works contract.	_____ Days
Computed Construction Completion Date	_____
5. Additional time for expected excusable delays for P.W. contracts. This time will only be added to determine the road completion date in a Timber Sale (C5.13#) not to determine contract time for a Public Works contract.	_____ Days
Final Road Completion Date	_____
Planned Timber Sale Termination Date	_____

* The time permissible may vary by local policy. Check with the Timber staff to see if there are any Regional supplements that may dictate the maximum time period.

The time period is comprised of the following items:

80 days for Engineering to convert the timber sale road contract to Public Works format, including modification of supplemental specifications, development of contract documents, and to submit road package to Administrative Services. Additionally, Job Codes must be set up, Work Plan developed, and IAS data entry and approval process must be completed

10 days to prepare contract documents and posting Fedbizopps.gov by AQM

15 days notice to public prior to solicitation.

30 days advertising period.

15 days to evaluate bids and make award

Consider additional time if access to project for pre-bid tour is not available due to inclement weather or other restrictions.

End of Davis-Bacon/Purchaser Wage Rate Adjustment

PROJECT REQUIREMENTS

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Section 151 - Mobilization (Labor 30-60 percent)

Mobilization costs are those for preparatory work and operation including bonding and tasks necessary for the movement of personnel, equipment, supplies, and incidentals to the project site, and for all other work and operations which must be performed or costs incurred including obtaining permits.

Average bids reflect that mobilization costs are 6 percent to 10 percent of the total project cost. Smaller projects tend to show mobilization as a higher percentage of the total project cost. The number of move-ins and operating seasons will increase this percentage. Listed are normal percentages for mobilization.

\$ 50,000	\$ 600,000	= 9%
600,000	899,999	= 8%
900,000	1,999,999	= 7%
1,200,000	over	= 6%

These percentages consider a normal project to have two construction seasons. *If specialized pieces of equipment or machines are required, the percentage should be increased. If the time and equipment method is used calculate mobilization, make allowances for obtaining permits, insurance, bonds, and moving personnel and materials to the job site.*

Roading Costs:

Roading costs can be used for time and equipment jobs, particularly for reconstruction projects. The method for calculating these types of move-in costs would be to determine the time to move to the project site and begin productive operation, then affix proper standby rates, usually 45 to 55 percent of listed rental rates, plus wage rates. For projects of this type and others where mobilization can be readily figured in as an integral part of the listed pay item, it may be unnecessary to include a separate mobilization pay item in the contract. Average roading costs are listed below for some standard equipment:

Equipment	Ave. Speed (Mi./Hr)	\$ per mile
Grader, Motor Patrol (CAT 12H)	20	5.50
Loaders, CAT 950G	20	5.22
Dump Trucks, 10-12 CY	30	3.35
Water Trucks, 4000 GAL	30	2.95
Service Trucks, 1 TON	30	2.01
Lowboys		
35 TON	25	4.63
50 TON	25	4.76

Project Requirements

Example: Location, Idaho (Area 1, Zone 2)

Total of all pay items without Section 151 = \$110,000

Rock Crusher required:

Cost (151) \$110,000 x .09 = 9,900

Crusher Movein/Moveout (Section 322) = 9,000

Total Cost Allowance Section 151 = \$ 18,900

Total Engineer's Estimate \$110,000 + \$18,900 = \$128,900

Mobilization should not exceed 10% of \$128,900, or \$12,900 (rounded), so place \$12,900 under Section 151 and \$6,000 under Section 322.

Section 152 - Construction Survey And Staking (Contract Item)

A. Road Location. There are no recent costs for this item at the present time.

B. Preliminary Survey. P-Line costs are generally dependent on survey standards, project access (drive, walk, camp, etc), terrain, vegetation density and time schedule. Establishment of spike camps can add costs to a project, long walks or difficult vehicle access can also increase the survey costs.

Detailed surveys of existing roads generally run higher than new construction due to the presence of cut/fill slopes, culverts, and other features. Reestablishment of old P-Line can be estimated to cost about \$740/mile, based on using a 2 person crew and a production rate of 1.5 miles per day.

Survey costs for A/E negotiated survey and design contracts should be estimated using the recent contract costs if known. Additional fieldwork may include items such as material and clearing classification, special site investigation, and stream flow estimates. The engineering firm will normally have a higher overhead cost because a business engaged in survey and design work usually has more office equipment, computers, etc. than a firm specializing in only survey work.

Hourly crew costs below are from RS Means Crew Cost Data Table for Crew A-7. The two-person field party consists of an instrument person and rod person, and is suitable for level loop surveys. The three-person field party consists of a party chief along with an instrument person and rod person, and is suitable for P-line surveys and slope staking.

Wages and Per Diem

a.	<u>Fieldwork</u> Two-person field party Three-person field party Supervision person	<u>Per Hour</u> \$107 \$159 \$68
b.	Per diem	\$40/person-day
c.	Transportation	\$.50/mile
d.	Motel, camp expenses	Variable, depends on project location (approximately \$50/day)

The following production rates should be used as a guide in estimating fieldwork:

1. *Brushing*: Three-person crew. The production for brushing is dependent upon density of stems and will vary with the requirements of the contract:

<u>Density of stems</u>	<u>Miles per day</u>
Extra heavy	0.35
Heavy	0.5
Medium	0.7
Light	1.0
Extra light	1.5

2. *P-line survey*: Three-person crew. This work includes collection of traverse and cross section data needed for low volume road design. The production for P-line survey is dependent upon the precision of survey and number of points of intersection (PI's) per mile, and the width of the cross-section swath. For average conditions consider a production rate of a half mile per day of completed work. Costs for completed surveys range from \$2150 - \$4150 per mile, including supplies(stakes, paint, flagging, etc.), and travel expenses(per diem, mileage, etc.) based on easy terrain and minimal brush.

P-Line Survey Production Rates

PI's per mile	Average Spacing(ft)	Miles per Day
176	30	0.35
132	40	0.45
106	50	0.55
88	60	0.68

3. *Traverse*: Three-person crew. The production for traverse is dependent upon the precision of survey and number of points of intersection (PI's) per mile. This cost estimate is broken down

Project Requirements

according to the precision desired. It is, therefore, mandatory for the estimator to know the precision required before making the estimate. The chaining difficulty is constant with the number of PI's per mile on which this cost guide will be based. For average conditions consider a production rate of a half mile per day of completed work.

Survey Accuracy Standard Refer to FSH 7709.56, pg 3.9--2 for precision standards

	Precision A,B	Precision C,D	Precision E,F
PI's per mile	Miles per Day	Miles per Day	Miles per Day
60 to 70		0.5	0.6
50 to 60		0.6	0.7
40 to 50	0.3	0.7	0.8
30 to 40	0.5	0.8	0.9
20 to 30	0.6	0.9	1.0
10 to 20	0.9	1.0	1.1
5 to 10	1.0		

4. *Levels:* Two-person crew. The production for levels is mainly dependent upon the precision of survey. Therefore, this cost guide is based on average production figures for a given precision. The estimator should use his/her own judgment and adjust these figures if they do not fit the individual project.

<u>Accuracy Standard</u>	<u>Miles per day</u>
A, B	0.5
C,D	0.7
E, F	1.0

5. *Cross Sections:* Three-person crew. Cross sections are generally constant in production between 0.4 mile to 0.7 mile per day. The brushing for extra heavy and heavy brush are figured in the brushing estimate. Therefore, this item will consider the slope only. If the estimator has unusual circumstances, he/she should adjust the production figures accordingly.

<u>Slope</u>	<u>Miles per day</u>
50 percent +	0.4
30 to 50 percent	0.6
0 to 30 percent	0.7

6. *Supervision:* Allow 1 day per week of survey crew time for supervisory engineer @ \$540 per day.

7. *Mobilization:* Allow move-in/move-out costs, supplies, transportation @ \$0.50 per mile.

8. *Checking Notes-Office Work:* All notes need to be office checked for completeness. Traverse and level notes need office work in recording and computation for angles and elevation. There is no per diem allowance for this work. Allow 1 to 2 hours per mile for one person at a rate of \$52 per hour.

9. *Materials Investigation and Testing:* See Section 153 or 154 for unit costs.

C. Road Design. (Includes classification, plan & profile, cross sections, and plan-in-hand reviews) Ranges from \$2,400 to 3,100 per mile for new construction.

D. Site Surveys. (Cost per site) \$2,600 to \$5,000 per site. Includes setting control, topo data collection, and plotting site plan.

E. Corner Search, Monumenting, and Boundary Marking & Posting. Contact the Forest Land Survey staff for costs associated with this type of work.

F. Construction Staking.

The base cost for Method II – Catchpoint Measurement Method, is \$3,000 per mile. This is based on using a 3 person crew, completing 0.5 miles per day, 120 points per mile, staking cut and fill catchpoints, and setting one RP stake per side. Includes costs for stakes, paint, markers, flagging, travel, and per diem. Average project -- assume camp is within 10 miles of project and access is at the beginning of each job and each job is two miles in length.

Add \$85.00 per culvert for culvert staking using the computed Method I. This is based on an allowance of 30 minutes per culvert.

Average base prices should be multiplied by the following factors to determine final unit cost.

Additional adjustment factors to apply to base unit cost:

- Method I – Computed Method x 1.5
- Slope staking one side – x 0.85
- Slope staking both sides – x 1.0
- Side slopes – x 1.0 for 0-30% to x 1.25 for 50% and over
- Brush density – x 1.0 for light to x 1.33 for heavy brush

Section 153 - Contractor Quality Control

These costs are to be included as subsidiary to the respective pay item in capital investment and 14i (turnback) estimates. **DO NOT HAVE QUALITY CONTROL AS A SEPARATE PAY ITEM!**

Section 154 - Contractor Sampling And Testing

There are four aspects of contractor sampling and testing:

- 1) Certificates of compliance
- 2) Field and laboratory sampling and testing
- 3) Field measurements
- 4) Records of sampling, testing, and measuring

Project records:

A) Projects that include controlled compaction for excavation, graded aggregate (not pit run), concrete, asphalt, major drainage structures, and similar work requiring specific sampling and testing (Included in FSSS 153 or FSSS 154).

- Approximately \$25/day while the above-noted work is in progress.
- Approximately \$15/day while the above-noted work is not in progress but work requiring contractor quantity measurements is in progress.

B) Projects that basically consist of clearing, excavation (Placement Methods 1 & 2), and minor culvert installation.

- Approximately \$15/day while work requiring contractor quantity measurements is in progress.

The following testing costs are from Materials Testing & Inspection, Boise, Idaho as of March 2007.

Item	Units	Rate
SOILS INSPECTION & TESTING		
Field Density Testing D2922	hours	\$38.00
Proctor D698, D1557/T99, T180	each	\$125.00
Sieve Analysis- Coarse & Fine C117, C136/T11, T27	each	\$70.00
Atterberg Limits D4318/T89, T90	each	\$90.00
Sample Pick Up	hours	\$35.00
Subgrade Inspector/Geologist	hours	\$80.00
CONCRETE INSPECTION & TESTING		
Concrete Inspector	hours	\$35.00
Epoxy Bolt/Dowel Inspector	hours	\$35.00
Concrete Cylinders C39/T22	each	\$15.00
Cylinders Pick Up	hours	\$35.00

Item	Units	Rate
MASONRY INSPECTION & TESTING		
Masonry Inspector	hours	\$35.00
Mortar Cylinders Strength C109/T106	set of 3	\$45.00
Grout Prisms C1019	set of 4	\$60.00
CMU Compressive Strength (Prisms) (Grouted) C1314	set of 3	\$225.00
CMU Compressive Strength (Block Only) C140	set of 3	\$75.00
CMU Absorption, Density & Moisture C140	set of 3	\$90.00
ASPHALT INSPECTION & TESTING		
Asphalt Field Density Testing D2922	hours	\$38.00
Asphalt Coring D979	hours	\$125.00
Asphalt Core Specific Gravity, Height, Dia., Weight	each	\$50.00
Asphalt Content-by Ignition Method D6307/T308	each	\$100.00
Mechanical Analysis D5444	each	\$55.00
MISC. ITEMS		
Professional Engineer	hours	\$100.00
Per Diem	day	\$75.00
Mobile Laboratory	month	\$1,500.00
Mileage	miles	\$0.54
Letter of Affidavit	hours	\$85.00

Overall costs for contractor sampling and testing, not including costs for individual tests, should range from \$500/week for relatively simple projects to \$1,400/week for more complex projects if only one technician is required. Add up to \$1,000/week for each additional technician required.

The cost of a mobile lab may be required for more complex projects.

When more than one road project is included in a contract, the costs for Section 153 should be prorated among the individual roads or road segments based on project size and the type of work included in each individual road project.

For those contracts or projects having a small amount of contractor Q/C per the FSSS's (no specific field tests), all costs are incidental to other items and should not exceed \$50-\$100/week. This cost is primarily associated with any contractor measurement that is required. For simplicity, it may be advisable to add this cost to Mobilization rather than spread it over several items.

Section 156 - Public Traffic

The cost of opening a road under reconstruction to traffic several times during the day can add as much as 50 percent to the normal cost of excavation, culverts, clearing, etc. This is due to the decrease in work efficiency and production on the part of the contractor and increased liabilities for public safety. Traffic volumes normally found on most Forest Service roads generally do not justify opening the road more than once during the work shift, and only if the road has significant traffic. If difficult construction work such as rock blasting or large culvert replacement is anticipated on existing roads, total road closure should be considered in the interest of public safety and cost savings. All too often road openings are for the convenience of the Forest Service and have little bearing on public use, particularly during weekdays.

Construction Induced Maintenance (CIM). Payment for construction induced maintenance can be made in several ways, depending on the situation. CIM should be included in and made a requirement of the contract, public works or timber sale.

A. When CIM is required to support a specific construction activity, payment and the cost estimate should be subsidiary to that item. Hauling of aggregate or borrow are examples of this. Maintenance associated with transport of right-of-way timber will be included in construction cost only for capital investment projects and only when timber becomes property of the contractor.

B. If the CIM is required to support general construction access and traffic, CIM can be a subsidiary item to mobilization.

C. If the amount of CIM is uncertain or likely to be variable, it may be advisable to estimate and make payment based on actual quantities under Section 622, Rental Equipment.

In all cases, appropriate Forest Service Supplemental Specifications to Section 156 are required to define the work and indicate how payment will be included in the contract. Due to the possibility of 14i turnbacks, C5.312 shall not be used to cover CIM under timber sales. Be sure to follow directions regarding commensurate shares when estimating and specifying this work.

Section 157 - Soil Erosion Control

This work consists of temporary and permanent measures incorporated into the project to reduce and control soil erosion and water pollution. The estimator should consider all measures used to provide this protection. Measures taken may be in areas that in the past have been considered "normal practice", i.e., waterbars constructed on roads during construction, or they may be items that have been designed specifically for erosion control. Timing may impact costs, i.e., if rock blankets are required prior to constructing a road to a pit run borrow source, an alternate source which may be more costly is necessary.

Costs may be estimated directly under Section 157 and shown on the Schedule of Items or may be subsidiary to other pay items. Some examples of cost item determination are:

Section 157.09 Diversions, Earth Berms. The purpose of the berm is for a reduction of erosion. Payment for this item may be subsidiary to other items or paid for under Section 157

Section 157.05 Filter Barriers, Silt Fence. This is a specialized pay item and would not fall under other items of work. It should be used in the contract specifically as a soil erosion item, under Section 157.

Section 157.11 Temporary Turf Establishment. This work is accomplished solely for the purpose of erosion control. The cost of this work is directly related to Section 157. This cost should not be considered under Section 625.

If the primary purpose of the windrow is slash disposal, this work should be priced under Section 201 and/or 203. When all or part of this cost is exclusively for erosion control, it should be shown as a cost under Section 157.

Cost Estimating Guidelines

For items not listed here or covered under other items, estimate by time, material and equipment. After calculating cost, determine labor percentage and make appropriate reductions for timber sales.

Some items associated with Soil Erosion and Water Pollution Control are:

<u>Suggested</u> 157/Parent	<u>Description of Work</u>	<u>Pay Unit</u>	<u>Estimated Cost</u>	<u>Percent Labor</u>
	<u>Temp Seeding & Fertilizing</u> Seed @ 30 lb/acre, seed & fertilizer in one application Fertilizer @ 200 lb/acre	Acre	\$360-\$560	20-40%
	<u>Dry Mulching (Weed Free Straw)</u> Seed @ 30 lb/acre Fertilizer @ 200 lb/acre Straw @ 2 tons/acre	Acre	\$1360-\$1550	30-40%
	<u>Hydromulching</u> (Wood Cellulose) Seed @ 40 lb/acre Fertilizer @ 200 lb/acre J-TACK H-S @ 120-160 lb/acre Wood Cellulose Fiber @ 150-300 lb/acre Hay or Straw @ 2 tons/acre Water as Necessary	Acre	\$2000-\$4000 (Approximate) Contact Suppliers	20-50%
	<u>Temporary Netting</u> Should price using specific Material / Labor, etc	S.Y.	\$2.50-\$4.10	60-70%
	<u>Straw/Hay Bales</u> (Weed free required) Bales placed by hand below CMP's prior to installation at live water; also used below outlet of cross-drains in highly erosive soil areas and in ditches.	Each	\$18-\$27	35-50%
	<u>Gravel Blanket</u> Sheathing	C.Y.	Est by Materials, Time & Equipment	
	<u>Silt Fence</u> 3 ft. high, includes wood stakes	L.F.	\$4-\$7	50-60%
Suggested 157 or 204 Parent	<u>Berm</u> Earth Berm	L.F.	\$0.15-\$0.20	30%

Suggested 157/Parent	<u>Description of Work</u>	<u>Pay Unit</u>	<u>Estimated Cost</u>	<u>Percent Labor</u>
	<u>Dam</u>	Each	Materials, Time & Equipment	
	<u>Temporary Water Bars</u> Constructed very shallow upgrade, but near CMPs and also midway between CMPs. Should be constructed just prior to compaction. Aggregate may be placed over temp waterbars, w/o removal. Temp waterbars will not provide adequate protection when installed with soil in overly saturated state. Not intended for permanent use. Equipment - Cat 12H w/ operator, rate of production is 15-20 bars/hr. Estimate construction just prior to compaction, no additional allowance made for compaction.	Each	\$7-\$9	30%-40%
Suggested 204/Parent	<u>Permanent Water Bars</u> Constructed to design depth and location. Equipment - Cat D7 w/ operator rate of production is 5-10 bars/ hour	Each	\$20-\$40	20%
	<u>Drain Dips</u> Equipment – D7 w/ operator and Cat 12H w/ operator	Each	\$95-\$130 Cost from Section 204	25%

Section 170 - Develop Water Supply And Watering (Labor 50-70 percent)

Estimated Quantity: for embankment, 5-10 gal/CY for base and surface courses, 35-44 gal/CY or 20-25 gal/ton.

Total Cost: Watering cost includes installing either a pump or gravity system to fill the tanker, filling time, and haul. Unit costs range from \$27 to \$33 per M-gallons, including haul (assuming 5 –10 mile round trip from water source).

Estimating development of water source: If any other work is required such as digging a basin, constructing a large check dam or constructing a spur road, compute these costs by using time and equipment methods.

Haul Costs: (Includes truck and driver time.) Calculate haul costs from the source to the center of project. Center of project is the center of embankment mass for excavation and linear center of project for base and surfacing.

Estimator is cautioned that designs including this section as a separate pay item require additional inspection and control by FS contract administration personnel during construction, coordinate with them when costing for this item.

Normally, watering costs are estimated using time and equipment and the cost is considered subsidiary and included in the unit costs of other items such as excavation and aggregate.

End of Project Requirements

CLEARING AND EARTHWORK

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Section 201 - Clearing And Grubbing (Labor 40-55 percent) & Section 202 - Additional Clearing And Grubbing

General

There are too many variables reflected in the bids to use them solely as a basis for costs. Therefore Figure 201-1 is given as a starting point for an "average" new construction project. The designer will need to consider the uniqueness of the project and estimate accordingly. Also consider the amount of vacant (no clearing) area in relation to the acreage being cleared. The factors used are based on the use of the hydraulic excavator for clearing/pioneering.

Clearing Classification

Classification by volume per acre of timber within clearing limits

The classification of clearing by volume per acre is shown on Figure 201-1, this section. It is essential that timber volumes be estimated within accuracy standards. Estimators should request gross volume figures from Vegetation Management for estimating use.

Clearing cost estimates should compensate for down material as well as that which is standing. In some cases the down volume is insignificant while in others it may be more difficult to handle than standing volume. Therefore, an adjustment factor for down material of 0 to 1.2 is appropriate.

Example:

Gross volume from timber cruise:	12 Mbf/Acre
Gross down volume:	6 Mbf/Acre
Factor for down material:	0.5
Volume for classification:	$12 + (6 \times 0.5) = 15$ Mbf/Acre

Classification by Stand Description

Clearing classification by stand description is based on a uniform mixture of large and small trees. The classification can be based on the stem spacing and average diameter as shown on Figure 201-2, this section, or by the guidelines below. Additional items to be considered are the amount and size of down material and the size of stumps and limbs.

- *EXTRA LIGHT*: Few tops and limbs. Few, if any, cull logs. Low scattered brush. Little or no falling or yarding of unmerchantable timber required.
- *LIGHT*: Light to moderate amount of tops and limbs. Few cull logs. Light brush. Little to moderate falling or skidding of unmerchantable required.
- *MEDIUM*: Light to moderate amount of cull logs. Many tops and limbs. Tall brush or dense unmerchantable trees requiring falling. Some unmerchantable material requiring skidding.

- **HEAVY:** Many tops and limbs from dense stand of unmerchantable timber. Tall, heavy brush or dense unmerchantable pole stand requiring falling and bucking numerous cull logs. Yarding of unmerchantable necessary.
- **EXTRA HEAVY:** Much cull material requiring falling. Many large, downed cull trees. Area may be swampy or wet. Closely spaced extra large stumps. Thick duff and other organic material.

Topographic Factor

The cost-per-acre figures should be adjusted by the following topographic factors:

<u>Ground Slope</u>	<u>Factor</u>
Gentle (under 20 percent)	0.8
Moderate (20 to 45 percent)	1.0
Steep (over 45 percent)	1.1-1.3
Areas that require more than one pioneer or a long boom machine due to high cut/fill	1.4-2.0

Slash/Cleanup Factor.

The cost-per-acre figures must also be adjusted by the slash cleanup factor if the required treatment method is other than windrowing. Care must be exercised in applying this factor, however. For example, "scattering" in steep terrain or in areas of dense undergrowth can result in significantly higher costs than windrowing. The adjustment factor 1.15 for scattering would apply for average side slopes and open understory. If stumps are to be split or partially buried, the factor used for them may need to be adjusted.

<u>Treatment Method</u>	<u>Factor</u>
Windrow	1.0 - 1.1
Windrow and Cover	1.25
Scattering	1.15 - 1.35
Burying	1.6 - 2.0
Chipping	1.75
Pile and Burn	1.6 - 2.0
Deck Unmerchantable Material	1.1
Disposal in Cutting Units	1.2
Removal	2.0
Piling	1.3
Placing slash on embankment slopes	1.4

Different treatment methods may be specified for Tops and Limbs, Logs, and Stumps. When this occurs, the following table should be used to prorate costs based on the treatment method specified for each type of slash. Adjustments can be made to meet local project conditions.

SLASH TREATMENT COMBINATIONS

Clearing Classification	Tops and Limbs (%)	Logs (%)	Stumps (%)
X-Light	30	10	60
Light	30	20	50
Medium	35	35	30
Heavy	40	30	30
X-Heavy	20	40	40

Example: For Medium Clearing
 Treatment Methods: Tops and Limbs - Pile and Burn
 Logs - Windrow
 Stumps - Scatter

$$\begin{aligned} \text{Adjusted Slash Treatment Factor} = \\ \text{Tops \& Limbs} \quad \quad \quad \text{Logs} \quad \quad \quad \text{Stumps} \\ (0.35)(1.6) \quad + \quad (0.35)(1.00) \quad + \quad (0.30)(1.15) = 1.26 \end{aligned}$$

Other: Additional areas and/or strips may need to be cleared, but not grubbed, for burning bays, decking areas, and for windrowing right-of-way slash in dense lodgepole pine stands. The cost allowances for these situations should consider the treatment of tops and limbs, and logs, but not stumps. Clearing costs associated with campgrounds will normally be higher.

Cost allowance for painting and branding of logs, where required, is considered incidental to the clearing cost estimate, no separate allowance is generally required.

Section 202 - Individual Removal of Trees (Labor 45-60 percent)

This includes falling and windrowing the slash of hazard trees that lie outside of the clearing limits. Average cost: \$85 per tree.

Cost to fall and leave snags outside of clearing limits = \$22 each

Figure 201-1 Clearing and Grubbing (Costs Based on Windrowing)

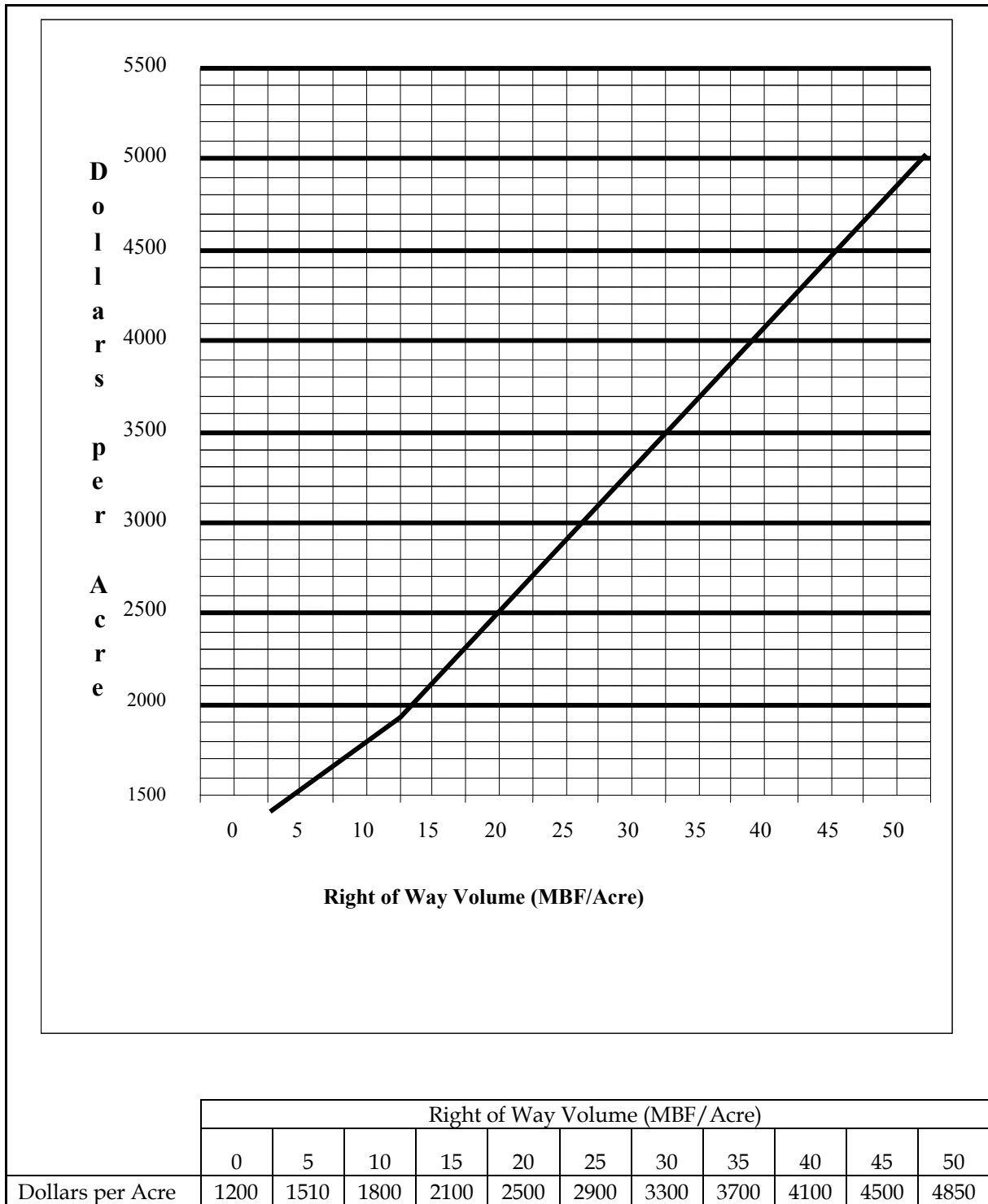
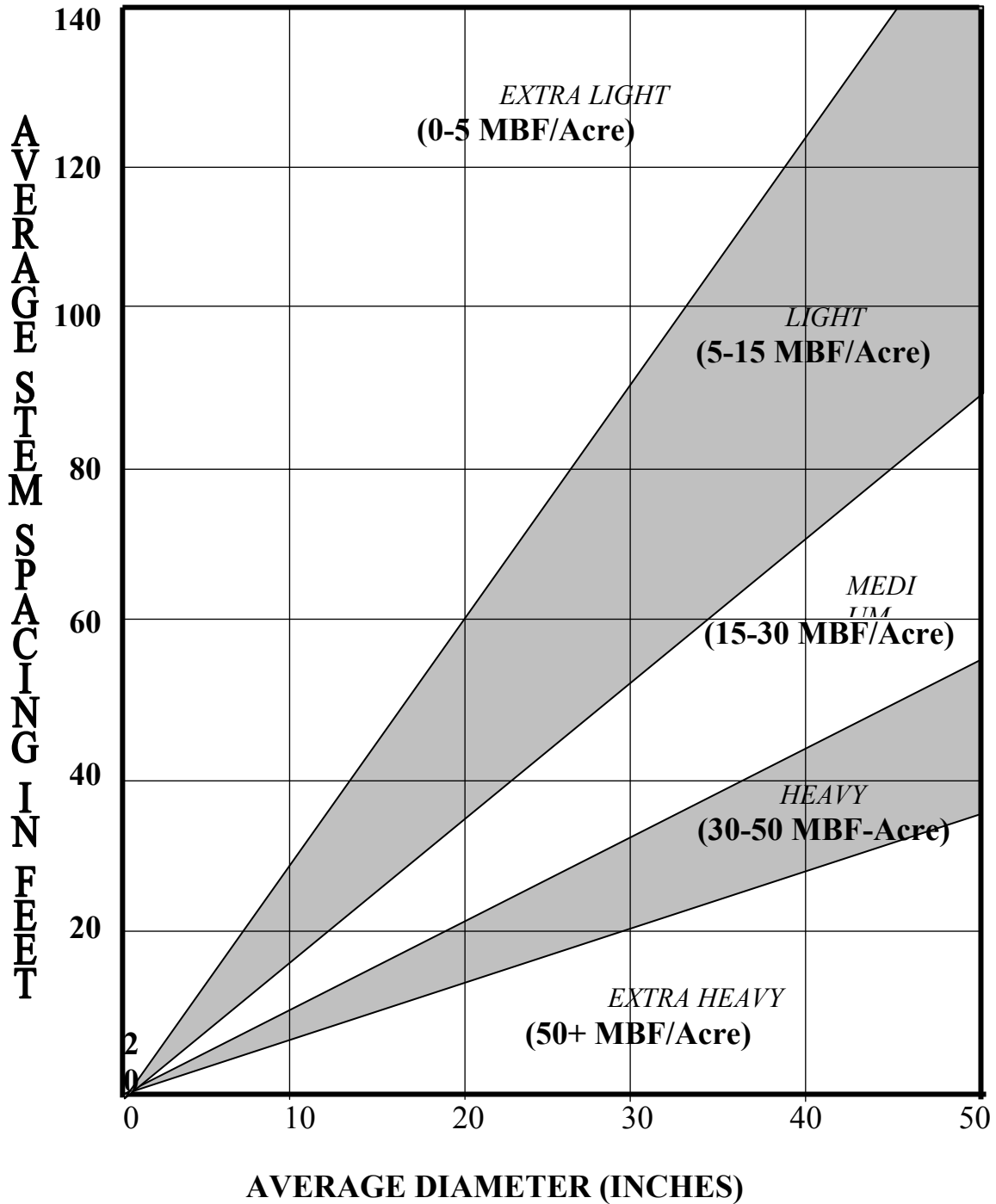


FIGURE 201-2 Equivalent Volume using Average Diameters and Stem Spacing



Clearing And Grubbing for Existing Roadbeds (Labor 40-60)

General: The designer will need to consider the uniqueness of the project and estimate accordingly. Consider the spacing as well as the diameter of the trees and brush to be cleared when classifying the material.

Clearing Classification By Stand Description: Clearing classification by stand description is based on an average mixture of size, spacing, and density of the trees and brush on the roadbed. Disposal method by scatter.

- *Light* (\$510-\$850/mile)
Few trees and low brush scattered along the shoulders of the roadway. Production rate approximately 3 – 5 hours per mile.
- *Medium* (\$850-\$1500/mile)
Trees and brush along the entire length of the shoulders of the roadway. Production rate approximately 5 – 7 hours per mile.
- *Heavy* (\$1500-\$2830/mile)
Trees and brush scattered throughout the entire roadway. This cost range considers the grubbing of the roadbed. Production rate approximately 7 –11 hours per mile.
- *Extra Heavy* (\$2830-\$5470/mile)
Trees and brush densely spaced along the entire roadway. This cost range considers the grubbing of the roadbed. Production rate approximately 11 –20 hours per mile.

Section 203 - Removal Of Structures & Obstructions (Labor 50-60 percent)

Removal of Existing Bridges: This item should be estimated on an individual basis. Use the equipment and labor costs in computing the cost. Typical prices are:

1. *Treated Timber Bridges:* \$4600 - \$7100, depending on abutment height and span. Disposal by hauling away treated timbers.
2. *Native Log Bridge:* disposal of timbers adjacent to site \$1620 - \$2430.

If a replacement structure will not be installed in the vacated crossing, allow for the cost of the appropriate road closure method and appropriate warning signs if needed.

Removal and Stockpiling/Disposing of Cattleguards: This item must be estimated on an individual basis. Cost of equipment, labor, disposal, move-in and move-out of any special equipment, etc., needs to be considered. Use the equipment and labor costs in computing the cost (see Section 622 and Labor Rates). Make allowance for filling in the hole resulting from the removal.

Removal and Disposal of Pipe Culverts: This should be estimated using time and equipment. Consideration should be given to the salvage value and disposal method of the culvert. Also consider if the culvert is being replaced at the same location.

Note: In addition to the above costs for removal of bridges, pipes, etc.; additional allowances may be necessary for removal of approach fills, reclamation and rehabilitation work, and for disposal of hazardous and toxic materials such as creosoted beams.

Section 204 - Excavation And Embankment (Labor 20-45 percent)

Bid history shows little fluctuations in unit prices due to project size. Localized conditions (slope, classification, etc.) have more impact on costs for small jobs because a full range of conditions may not exist as in a larger job.

Excavation for constructing catch basins on reconstruction projects which add drainage should have the same unit cost as the culvert excavation. Both jobs will be done using the same equipment; therefore, costs should be similar. This should be a separate pay item.

The average base cost of common excavation in Idaho Zone 1 is \$1.51/cy. This is based upon an effective hourly production rate for a CAT D7H of 120 CY/hour.

Material adjustment factors are as follows:

<u>Type</u>	<u>Factor</u>
Common	1.0
Loose rock	1.5-1.75
Talus rock	1.5
Small glacial Boulders	1.75
Rippable rock	3.0
Large glacial boulders	5.0
Solid/Shot rock	5.0-8.0

Base costs are to be adjusted by adding the following if required.

1. *Tolerance Class:* See No. 4 (Finishing).

2. *Compaction Method:* (Does not include water, make an allowance for water, include cost in 204)

Compaction Methods from complete WO FSSS 204	\$/cy
Method A(1) – More than 80% retained on a No.4 Sieve	\$0.98
Method A(2) – 50% to 80% retained on a No.4 Sieve	\$1.22
Method A(3) – Less than 50% retained on a No. 4 Sieve	\$1.40
Method B – Roller Compaction – min. 3 passes	\$0.59
Method C – Compaction by Hauling and Spreading Equipment	\$0.36

Clearing and Earthwork

3. Benching Fill Slopes: with D-7 dozer

30-50 percent slope:	\$1.08/LF
> 50 percent slope:	\$1.81/LF

Note: If hydraulic excavators are used, there will be no additional cost for benching fill slopes as work will be done during clearing/pioneering.

4. Finishing:

a. *Scarifying:* Includes motor patrol, laborer, and pickup

Type	Rate	\$/Mile
Light	3 hours/mile	\$510
Average	4 hours/mile	\$680
Heavy	6 hours/mile	\$1020

b. *Shaping and Finishing:* Make additional allowance for watering if needed

Single Lane Roads with Ditch -- \$/Mile

Tolerance Class	A	B/C	D/E	F/G/H	I/J/K/L/M
Rate (hrs/mi)	28	18	8	6	4
Cost*	\$4780	\$3100	\$1370	\$1030	\$690

* Single Lane Roads without Ditch -- \$/Mile

Tolerance Class	A	B/C	D/E	F/G/H	I/J/K/L/M
Rate (hrs/mi)	16	10	6	4	2
Cost*	\$2740	\$1710	\$1030	\$690	\$350

* For Double Lane, multiply single lane cost by 1.35.

5. Loading Material into Trucks:

	\$/cy
Common and loose rock	\$0.64
Ripped rock	\$0.90
Blasted rock and large boulders	\$3.00

6. Conservation of Rock:

For use when excavating with a dozer and excavator and placing in small stockpile within 300 ft. When excavating and hauling to central stockpile or use point beyond 300 feet, the added cost of loading and hauling should be calculated.

Push Distance →	150 Feet	300 Feet
	\$6.45/cy	\$7.13/cy

7. Haul:

Haul should be calculated by Time and Equipment methods.

8. *Conservation of Topsoil:* Assume 3" layer of topsoil, 14 feet wide
- a. Stripping topsoil and windrowing with grader, relatively flat ground: \$0.78/cy or \$530/mile
 - b. Stripping topsoil with tracked loader and placing in stockpile within 300 ft.: \$2.00/cy or \$1350/mile

9. *Traffic Control:*

- a. *Open to traffic twice during shift:* Sum excavation costs (Base cost plus options) and add 30 percent.

Example: Summed cost for 204 = \$5,700. Adjusted cost with traffic control = \$5,700 x 1.3 = \$7,410

- b. *Open to traffic once during work shift:* Sum excavation costs (Base cost plus options) and add 15 percent.

- c. *Open to traffic at end of work shift:* Sum excavation costs (Base cost plus options) and add 5 percent

10. *Water:* estimate under Section 170 (see Complete WO FSSS 170), or include an allowance under this item.

11. *Pit Development:* estimate under Section 651 (see Complete WO FSSS 651).

Rounding Cut Slopes. This work, if specified, applies to sophisticated "rounding" after initial pioneering and excavation, and not to blending of the cutslope with the natural ground during initial excavation which is done by a hydraulic excavator. Estimate by time and equipment, costs range from \$0.63 to \$0.95/LF.

Drainage Excavation and Furrow Ditches. Drainage excavation can be estimated most easily by the lineal foot. The same piece of equipment is required for small quantities or larger amounts; but one may use something less efficient for very small amounts. Site conditions govern more than size considerations; estimate by time and equipment procedures.

Drainage Dips. Drainage dips on reconstruction can be estimated at \$95 to \$130 each depending on difficulty of excavation. If armoring of dips is desired, make an allowance for the work incidental to the installation of the dip or include the appropriate aggregate item.

Earth Berms. Continuous Berms cost about \$1070 per mile or \$.20/LF

Clearing and Earthwork

Sample Earthwork Calculations

Given: 4.96 miles of single lane, native surfaced road with ditch, Compaction Method C, Tolerance Class G, 30% labor. Design is self-balanced, no allowance for haul is needed.

- Location: Utah Zone 2
1. 80,000 cy excavation
70 percent common
15 percent rippable rock
15 percent blasting rock
 2. Benching: 30-50 % slope - 1500 LF, >50% - 2500 LF
 3. Finishing:
 - a. Scarification: light -2.18 miles, average -1.36 miles, heavy - 0.28 miles
 - b. Shaping and Finishing: 4.96 miles
 4. Traffic Control - N/A.

Solution: Location: Utah Zone 2

Common: 80,000 cy * 0.70 * \$1.51	84,560.00
Rippable: 80,000 cy * 0.15 * 3.0 * \$1.51	54,360.00
Blast: 80,000 cy * 0.15 * 5.0 * \$1.51	90,600.00
Benching (30-50 percent): \$1.08 * 1,500	1,620.00
Benching (> 50 percent): \$1.81 * 2,500	4,525.00
Compaction Method C: 80,000 cy * \$0.36	28,800.00
Finishing: (Tolerance Class G)	
Scarifying:	
Light: 2.18 mi * \$510	1111.80
Average: 1.36 mi * \$680	924.80
Heavy: 0.28 mi * \$1020	285.60
Shaping and Finishing: 4.96 mi * \$1030	5108.80
 Total Engineer's Estimate	 \$271,896.00

$$\text{Unit Cost} = \frac{\$271,869.00}{80,000 \text{ cy}} = \$3.40/\text{cy}$$

For Utah Zone 2, the Adjustment Factor for Public Works Davis–Bacon Zones is 0.95 for 30 % labor. (Note: The adjustment factor comes from Table 3 in the Engineer's Estimate section of this guide)

For all Zones in Utah, the Adjustment Factor for Equipment Differences is 0.98 for 30 % labor. (Note: The adjustment factor comes from Table 4 in the Engineer's Estimate section of this guide)

$$\text{Adjusted Unit Cost for Engineer's Estimate} = \$3.40 * 0.95 * 0.98 = \$3.17/\text{cy}$$

Haul (30-40 percent labor) This is not a pay item, costs are incidental to and included in other items of work.

(Labor: Cu Yd Mile, 35 percent. Note, the haul of asphalt and aggregate may be a contract item. If so, do not reduce, if the subcontractor is expected to pay Davis-Bacon wages)

Cost for cubic yard-mile haul of excavation, aggregate, riprap, borrow excavation, etc., should be derived with the use of the following procedure.

Haul of material includes the fixed costs (for the truck only) of spotting, loading, dumping, and turnaround in addition to the variable "underway" cost while hauling equipment is moving. Loading costs for the loading labor and equipment should be included under the parent specification for that work.

Haul of excavated material is to be measured (for payment) in terms of excavated cubic yards in the original position (in place). Costs shown below are based on loose cubic yards; therefore, a compaction factor adjustment (CF) must be made to provide costs based on excavated cubic yards.

$$CF = \frac{\text{in place density}}{\text{loose density}}$$

To compute haul of aggregate, borrow, riprap, etc., the compaction factor, CF, must be adjusted to fit the method of measurement; i.e., in place, vehicle quantity, compacted in place, etc.

When computing variable haul cost, the estimator should consider all the factors that effect the haul over each segment of the haul route. These factors include grade, alignment, road width, type of surface, road condition, sight distance, turnout spacing, and other traffic using the road. Use the correct truck for the type of road on the haul route (belly dumps are inappropriate for crooked narrow roads).

Variable costs should be increased if load limits (bridges, city streets, etc) on the route preclude loading trucks to rated capacity. The average distance from the point of dumping to the turnaround should be included in the variable cost haul distance. On single-lane roads this may range up to 2-3 miles additional length, on two-lane roads no addition is usually necessary since the trucks can turnaround nearby. Also, if there are similar conditions at the material source which affect travel distance, make allowance.

The following are general guidelines the estimator should use in determining average round-trip travel speeds for haul computations.

<u>Average Travel Speed</u>	<u>Road Characteristics</u>
5-15 mph	Narrow dirt road, steep grades, numerous sharp curves, poor sight distances and few turnouts
10-30 mph	Dirt or gravel surface, single lane, grades to 8%, fair to good alignment, adequate turnouts, and good sight distance
25-50 mph	Gravel or paved surface, double lane, moderate grades to 6%, good to excellent alignment, excellent sight distance

Clearing and Earthwork

Fixed Cost: (Increase fixed costs to reflect difficult or unique situations in loading or dumping material, such as asphalt or riprap.)

12 CY End Dump	\$1.44/CY
20 CY Bottom Dump	\$1.45/CY

Variable Cost: \$/CY-Mile (computed based on round trip distance):

	12 CY End Dump (\$/CY-Mile)	18 CY Bottom Dump (\$/CY-Mile)
<u>mph</u>		
10	\$1.69	\$1.26
15	\$1.13	\$0.85
20	\$0.85	\$0.63
25	\$0.68	\$0.51
30	\$0.56	\$0.42
40	\$0.42	\$0.32
50	\$0.34	\$0.25

The following is a sample format to be used for computing variable cost.

HAUL COST QUANTITY _____ LOOSE CUBIC YARDS

Road Segment or Number	Avg. Speed Roundtrip	Length in Miles (one way)	Variable Cost (\$/CY – Mile)	Cubic Yards Hauled	Total Variable Cost(\$)
333	25	10.5	\$0.68	550	\$3927

Calculate the Variable Cost in dollars for each segment by multiplying the one way haul distance in miles by the Cubic Yards Hauled over that segment times the Variable Cost Rate(\$/CY Mile) which is based on the average speed and type of truck used.

Example: Using 12 CY End Dumps; 10.5 miles x \$0.68/CY-Mile x 550 CY = \$3927

Calculate the Fixed Cost by multiplying the Fixed Unit Cost for the type of truck hauling by the number of Cubic Yards hauled.

Example: Using 12 CY End Dumps; \$1.44/CY x 550 CY = \$792

The *total haul cost* is the sum of the variable costs and fixed cost = \$3927 + \$792 = \$4719

Section 208 - Structure Excavation And Backfill For Selected Major Structures (Labor 40 percent)

Typical costs: \$27 to \$37 CY . More if large boulders are present or if there are excessive dewatering problems. Make allowances for sampling and testing if required by the specification used. The work includes excavation required to get down to foundation elevation and sufficient trench width to install the structure, backfilling, and compaction with a roller. If excavated material cannot be placed adjacent to the site on the roadway, make an allowance for haul to a temporary stockpile site. The haul allowance should also include the cost for loading trucks at the temporary stockpile site for return haul to the structure, and the cost of the return haul.

Higher prices can be expected for excavation of large boulders, solid rock, etc.

Section 211 - Roadway Obliteration (Labor 20-35 percent)

Obliteration may range from merely blocking access to a road to allow natural vegetation to become re-established, to ripping and scarifying the road surface, removing culverts, and rounding off the cutslope to complete removal of the road template and recontouring to the original natural profile. A laborer should be included to saw replacement slash and seed/fertilize behind the equipment, if required. The costs below are for reference, using the assumptions shown. Due to the variance in complexity to obliterate a road, time and equipment methods should be used, and production rates should be site specific to the roadway to be obliterated.

For roadbeds where just outsloping the template is required, costs range from \$820 – 1220 per mile. This cost is based on production rates from 4-6 hours per mile with a D-7 dozer.

For light scarifying with a grader, \$400 - \$540 per mile. These costs are based on production rates of 3-4 hours per mile.

For ripping 6 – 12 inches with a dozer (one complete pass out and back), \$410 – \$810 per mile. These costs are based on production rates of 3-4 hours per mile.

For removal of shallow installed cross drain culverts, allow 1-2 hours per removal with an excavator, depending upon fill height. Cost ranges from \$130 - \$260 each.

For culverts with higher fills, or culverts in live streams, cost out by time and equipment methods, taking into account the quantity of excavation required, and whether or not haul to a disposal site is needed. In addition, make cost allowances for stream diversions, additional clearing required to remove culvert, and slash disposal.

For all culvert removals, make allowance for disposal of the culverts; typically this is removal from National Forest land. If the culverts are to be salvaged and stockpiled, allow additional time for removal, as more care will be required during excavation to avoid damaging the pipe.

For non-drivable water bars, use a rate of 10 per hour with a D-7. Cost is \$20 each.

For roads requiring full re-contour, a dozer and excavator working together is typically used. Typical production rates range from 200 LF per hour for low to moderate sideslopes (10-30%), to 100 LF per hour for steeper sideslopes (>30%). In order to recover the entire fill embankment additional clearing may be required to reach the toe of fill. Costs range from \$8100 - \$16,000 per mile.

Blocking access to a road may be accomplished by a gate, Jersey Barriers, boulders, or other means. Follow the Forest policy for blocking access and consider signs if appropriate. Cost out the work by time and equipment methods. Also consider signs if appropriate.

Other requirements may include seed, mulch, and fertilizer. Contact your local Botanist to determine appropriate seed mix, mulch type, and fertilizer to apply, as well as the recommended application rates. Also, consider appropriate seeding season to optimize successful seed catch. On roads with culvert removals or re-contouring, the seeding must be done as the work progresses from the end toward the beginning as access will be cut off.

Section 212 - Linear Grading (Labor 40 percent)

This section is intended for use on single purpose roads in relatively gentle/moderate and uniform terrain. It can be used in conjunction with most construction control methods. The specification combines clearing and grubbing, excavation, and erosion control. Use of this specification is NOT appropriate for roads with complex horizontal alignments, numerous culvert installations, or over dissected topography where non-self balanced sections prevail.

The entire preconstruction effort including location, survey, design, and cost estimating should be consistent with the road standard, desired end product, and risk factor. A high degree of sophistication is not warranted when developing the cost estimate for this work.

Use of Tables 212-1 through 212-4 on the following pages is quite appropriate and fits the intent of the specification. The tables are for roads without a ditch. The assumptions listed below were used in preparing the tables:

Excavation	Based on self-balanced sections. Use appropriate compaction factor column for your soil type. No allowance is included for drain dips, finishing and/or shaping, slough widening, curve widening, turnouts, turnarounds, or haul.
Clearing and Grubbing:	Clearing limits (3 ft beyond top of cut – 10 feet beyond toe of fill to allow for slash windrow construction) - minimum 24' width Topographic factor - see Section 201.
Seeding	Seed cut and fill slopes only that are 1:1 or flatter

Note: To ensure that your slopes are never misunderstood, insert a "V" and an "H" in the ratio. For example: 1V:3H.

To determine costs, use the procedure outlined below. Be sure to use the correct table for the appropriate road backslope and road template.

Step 1 Determine which quantity table to use based on road width and backslopes.

Step 2 Determine excavation quantity in cubic yards per mile using the existing average sideslope and applicable compaction factor. Multiply the CY per mile by the length of the road segment in miles to get the total excavation. Obtain the base excavation cost from Section 204. Adjust the excavation cost for materials, topography, and additional widening by multiplying the base excavation cost by the respective adjustment factors. Add additional cost for scarifying (if necessary), drainage dips, haul, etc.

$$\text{Material Factor} = (\% \text{ Common})(1.0) + (\% \text{ Loose Rock})(1.5-1.75) + (\% \text{ Rip})(3.0) + (\% \text{ Blast and Boulders})(5.0)$$

$$\begin{aligned} \text{Topography Factor} &= \text{Self balanced sections} = 1.0 \\ &\text{Some through fills and free haul} = 1.25 \end{aligned}$$

$$\text{Widening Factor} = \text{No additional widening} = 1.0$$

For slough widening, turnouts every 1,000 ft, log truck curve widening, turnarounds one per mile use a factor of 1.15, or add cost using 204 for turnouts as follows. For turnarounds, double the Cu Yds.

	Cu Yds	
Sideslopes	Turnouts	Turnarounds
20%	31	62
40%	86	172
60%	223	446

Drainage Dips: see Section 204 for costs

$$\text{Total Excavation Cost} = (\text{Base Cost}) \times (\text{Material Factor}) \times (\text{Topography Factor}) \times (\text{Widening Factor}) + (\text{Drainage Dips}) + (\text{Haul})$$

Step 3 Determine Clearing and Grubbing quantity in acres per mile by using the existing average sideslope. (Note: the minimum clearing width is 24 feet or 3 acres per mile.) Multiply the Acres per mile by the length of the road segment in miles to get the total clearing acres. The acres per mile in the Tables are based upon a clearing limit of 10 feet beyond the toe of fill to allow room for windrow construction. If the additional clearing area is NOT required, reduce the clearing acres by $10 \text{ ft} \times 5280 / 43560 = 1.2$ Acres per mile for sideslopes above 30%. Obtain the base clearing cost per acre from Section 201 for the applicable clearing classification. Adjust the clearing cost by multiplying the base clearing and grubbing cost by the slash disposal adjustment and the widening factors.

Slash Disposals Factors:

Windrowing	1.0-1.1
Scattering	1.15-1.35
Piling	1.3

Widening Factors:

No additional widening	1.0
Slough widening, turnouts, log truck curve widening, turnarounds	1.2

Step 4 Determine the Seeding quantity in acres per mile by estimating using the existing average sideslope. Multiply the Acres per mile by the length of the road segment in miles to get the total seeding acres. No seeding is applied to 1.33V:1H (¾:1) slopes as seed and mulch will not stay in place. Obtain the costs for the seed/mulch/fertilizer application from Section 625.

Step 5 Total results from steps 2, 3, and 4 to determine unit cost.

Linear Grading Cost Example:

Location:	Wyoming Zone 1
Length:	1.7 miles
Average side slope:	30 percent
Compaction factor:	25 percent
Clearing classification:	Medium (25Mbf/Acre)
Windrow construction slash	
Excavation classification:	
85 percent common	
15 percent rip	
0 percent blast	

Template: 14 ft w/o ditch, 1.33V:1H (¾:1) backslope, self balanced sections, no through fills or free haul. Allow for turnouts every 1,000 feet, normal curve widening, one turnaround per mile, and 4 drainage dips. Seed, dry method, without mulch.

Step 1: Base excavation cost = \$1.51 per CY (from Section 204)

Cubic Yards = 2353 CY/mile(from Table 212-4) x 1.7 miles = 4,000 CY

Adjusted excavation cost:

$$\text{Material Factor} = (0.85 * 1.0) + (0.15 * 3.0) + (0 * 5.0) = 1.3$$

$$\text{Topography Factor} = 1.0$$

$$\text{Widening Factor} = 1.15$$

$$\text{Drainage Dips} = 4 @ \$95 \text{ each} = \$380$$

$$\text{Cost} = (4,000 \text{ CY} * \$1.51 * 1.3 * 1.0 * 1.15) + \$380 = \$9,029.80$$

Step 2: Base Clearing Cost = \$2,900 per Acre (from Section 201)

Clearing Acres = 4.0 Acres/mile x 1.7 miles = 6.8 Acres

Adjusted Clearing Cost:

Slash Disposal Factor = 1.0

Widening Factor = 1.2

Cost = \$2,900 per acre * 4 Acres * 1.0 * 1.2 = \$13,920

Step 3: Seeding Cost = \$640 per mile (from Section 625)

Seeding Acres = 0.6 Acres/mile x 1.7 miles = 1.02 Acres

Cost = \$640 per Acre x 1.02 Acres = \$652.80

Step 4: Total Cost = \$9,029.80 + \$13,920 + \$652.80 = \$23,603

Unit Cost per mile = \$23,603/1.7 miles = \$13,884 / mile

For Wyoming Zone 1, the Adjustment Factor for Public Works Davis–Bacon Zones is 0.87 for 40 % labor. (Note: The adjustment factor comes from Table 3 in the Engineer’s Estimate section of this guide)

For all Zones in Wyoming, the Adjustment Factor for Equipment Differences is 1.03 for 40 % labor. (Note: The adjustment factor comes from Table 4 in the Engineer’s Estimate section of this guide)

Adjust for Wyoming Zone 1 (labor, 45%): \$13,884 per mile * 0.87 * 1.03 = \$12,440 per mile

Table 212-1

Construction Quantities for Specification 212
 12 Foot wide template, no ditch, backslope 1V:1H, fill slope 1V:1.5H

Average Sideslope (%)	20 % Comp. Excavation per mile (CY)	25 % Comp. Excavation per mile (CY)	30 % Comp. Excavation per mile (CY)	Clearing per mile (Acre)	Seeding per mile (Acre)
10	413	413	413	3.2	0.3
20	1044	1087	1130	3.5	0.6
30	1889	1932	2021	3.9	1.1
40	3121	3210	3301	4.5	1.9
50	5258	5352	5495	5.6	3.3
60	10206	10423	10639	8.5	6.9

Table 212-2

Construction Quantities for Specification 212
 14 Foot wide template, no ditch, backslope 1V:1H, fill slope 1V:1.5H

Average Sideslope (%)	20 % Comp. Excavation per mile (CY)	25 % Comp. Excavation per mile (CY)	30 % Comp. Excavation per mile (CY)	Clearing per mile (Acre)	Seeding per mile (Acre)
10	636	636	636	3.5	0.3
20	1406	1456	1505	3.8	0.7
30	2540	2590	2692	4.3	1.3
40	4277	4382	4541	5	2.2
50	7198	7362	7587	6.2	3.8
60	13795	14109	14360	9.7	8.1

Table 212-3

Construction Quantities for Specification 212
 12 Foot wide template, no ditch, backslope 1.33V:1H, fill slope 1V:1.33H

Average Sideslope (%)	20 % Comp. Excavation per mile (CY)	25 % Comp. Excavation per mile (CY)	30 % Comp. Excavation per mile (CY)	Clearing per mile (Acre)	Seeding per mile (Acre)
10	386	386	496	3.2	0.1
20	965	1012	1022	3.4	0.3
30	1670	1726	1785	3.7	0.5
40	2693	2753	2875	4.1	0.9
50	4113	4239	4366	4.7	1.4
60	6493	6626	6830	5.8	2.5

Table 212-4

Construction Quantities for Specification 212
 14 Foot wide template, no ditch, backslope 1.33V:1H, fill slope 1V:1.33H

Average Sideslope (%)	20 % Comp. Excavation per mile (CY)	25 % Comp. Excavation per mile (CY)	30 % Comp. Excavation per mile (CY)	Clearing per mile (Acre)	Seeding per mile (Acre)
10	556	556	620	3.5	0.2
20	1328	1393	1460	3.7	0.4
30	2286	2353	2421	4	0.6
40	3658	3798	3869	4.5	1
50	5520	5665	5811	5.2	1.7
60	8802	9038	9076	6.5	2.9

End of Clearing and Earthwork

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**SLOPE REINFORCEMENT
AND
RETAINING WALLS**

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Section 251 - Riprap (See individual items for labor reduction)

A. Range of costs per cubic yard including haul for bridges and culverts (includes manufacturing, furnishing, and placing):

Hand-Placed Riprap: (Labor 75 percent) Ranges from \$74 - \$123 per CY depending upon difficulty of gathering rock.

Dumped Riprap: (Labor 40 percent) Ranges from \$17 - \$34 per CY depending upon difficulty of sorting, loading rock, and the haul distance from the source.

Machine-Placed Riprap: (Labor 35 percent) Ranges from \$47 - \$64 per CY depending upon difficulty of sorting, loading rock, haul distance from the source, and difficulty of placing with an excavator.

Sacked Soil Cement: (Labor 60 percent) Estimate by time, materials and equipment

Sacked Concrete: (Labor 60 percent) Estimate by time, materials, and equipment

Wire-Enclosed Riprap: (Labor 75 percent) Estimate by time, materials, and equipment

Riprap must be estimated on an individual basis due to such a variety in size, shape, and difficulty of installations. Unit costs are to include furnishing, placing, and haul of riprap. Also includes cost of woven wire, lacing or tie wires, stakes, and labor to place and enclose riprap.

- B.** Calculate haul cost using prices listed in the haul section of this cost guide.
- C.** Development of the pit or source if required should be calculated using time and equipment.
- D.** Royalty charge in private pits obtained from pit owner - see Section 301 or 641.
- E.** Drilling and blasting cost of quarries (if required) - see Section 301 or 641.
- F.** Access road development, if required - use time, and equipment.
- G.** Geotextile, if used - estimate material prices and pay under Section 207.

Section 253 - Gabions And Revet Mattresses (Labor 30-40 Percent)

General cost range is \$100 to \$150/CY (materials and installation).

Cost of Gabion baskets:	6 Ft Long	Cost/CY	12 Ft Long	Cost/CY
3 ft x 3ft	\$67.44	\$33.72	\$119.84	\$29.96
3 ft x 1.5 ft	\$51.89	\$51.89	\$91.40	\$45.70
3 ft x 1 ft	\$45.68	\$69.21	\$79.87	\$60.05

Gabion materials costs for ArtWeld gabions from Hilfiker. Includes all hardware. Does NOT include shipping to job site.

The installation cost must be estimated on an individual basis. The variety of sizes available and design needed can change costs. Equipment needed and cost of rock must be considered. Use time, material, and equipment to determine cost and % labor for this item.

Call suppliers for current costs:

Name	Address	Phone	Fax	Contact
Terra Aqua Inc.	PO Box 7546 Reno, NV 89510	775 828-1390 800 736-9089	775 828-1394	Noel Cline
Maccaferri Gabions, Inc.	3650 Seaport Blvd. West Sacramento, CA 95691	916 371-5892 800-328-5805 PHX 602 246-9071	916 371-0764	Jeff
Modular Gabion Systems	PO Box 160667 Aurora, CO 80040 1110 Montlimar Drive Suite 425 Mobile, AL 36609	800 693-9640 334 380-0332 CO 303 341-2604 800-228-3671	334 380-0746	George Ragazzo
Vance Bros., Inc.	PO Box 369 Aurora, CO 80040	303-341-2604 800-228-3671	303-341-2036	Chance Foreman
Hilfiker Retaining Walls (ArtWeld Gabions)	3900 Broadway PO Box 2012 Eureka, CA 95502-2012 PO Box 39 Levan, UT 84639	707-443-5093 800 762-8962 435 623-1433	707-443-2891 435 623-1434	Suzane Brent Taylor

Section 255 - Mechanically-Stabilized Earth Walls (Labor 40 percent)

General cost range is \$25.00 - \$45.00/S.F. of frontal face.

Each project is unique and must be estimated on material, labor, and equipment basis.

Section 257 - Alternate Retaining Walls

This item must be estimated on an individual basis. The variety of types and the site conditions can affect the unit costs. Use time, material, and equipment to determine cost and % labor for this item.

Types available include:

- Steel Bin Retaining Wall
- Treated Timber Bins
- Culvert Retaining Wall
- CRIBLOCK (Concrete bins)
- Reinforced Concrete (tie-back/cantilever)
- Chain Link
- Gabion
- HILFIKER (Welded Wire)
- Treated Timber Lag Wall
- Treated Timber-Faced Wall
- Fabric Wall

Section 262 - Reinforced Soil Embankment

This item must be estimated on an individual basis. The variety of types and the site conditions can affect the unit costs. Use time, material, and equipment to determine cost and % labor for this item

Geocell material Standard Cell Sizes 3" x 8' x 20' 4" x 8' x 20' 6" x 8' x 20' 8" x 8' x 20' Large Cell Sizes 3" x 8' x 40' 4" x 8' x 40' 6" x 8' x 40' 8" x 8' x 40'	Geocell materials are porous and non-porous as well as manufactured in widths and lengths other than those shown here. Call a local supplier to get the correct material and size for your application.
Select granular backfill including haul	Calculate haul using instructions in section 204.
Placement	Use Time and Equipment Method. Call supplier for support.

Slope Reinforcement and Retaining Walls

Suppliers:

Name	Address	Phone	Fax	Contact
Geo Products	8615 Goldon Spike Ln Houston, TX 77086	281 820-5493	281 820-5499	Al Florez
Soil Stabilization Products Co.	PO Box 2779 Merced, CA 95340	209-383-3296 800-523-9992	209 383-7849	Samuel Randolph
US Fabrics Inc.	3904 Virginia Ave. Cincinnati, OH 45227	800 518-2290		
GeoCell Systems Inc.	San Francisco, CA 94158	415 541-5300		

End of Slope Reinforcement & Retaining Walls

AGGREGATE COURSES

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Section 303 - Road Reconditioning (Labor 40-60 percent)

Normally, the majority of "reconditioning" work should be done with a grader with some minor blasting and/or tractor work for localized rock problems. More extensive work should be covered in the appropriate sections. *Good* field classification and design will usually avoid the problem of calling for use of this specification when more appropriate work items may be needed. Other examples can be traced to situations where, through years of maintenance a roadway has been widened and shifted slightly away from the original alignment. Trees that used to be outside the shoulder by 5-10 feet, were eventually cut down for safety reasons, *but the stumps remain* in what now is the shoulder. Estimator should also watch out for *subgrade boulders* which were originally well covered by native subgrade material, but the covering is now thin or absent.

Removing Slides: Use time and equipment costs. (Estimate all slides in excess of 10 cubic yards per station under Section 204).

Pull ditches with grader: \$340/Mile. Assumes 2 hours/mile production rate with grader, laborer, and pickup

Clean catch basins with backhoe: \$36 each. Assumes 15 minutes per catchbasin to clean, reshape, and dispose of material on roadbed if suitable, or on fill slope.

Scarifying and shaping, costs in \$/mile, use grader, laborer, and pickup: Average production rate = 4 hours/mile, Heavy = 6 hours/mile. Rate for double lane road = single lane x 1.35

	Single Lane	Double Lane
Average	\$ 685	\$ 925
Heavy	\$1,025	\$1,385

Finish grading with blade, \$/mile: Assumes all oversize has been removed, hence no laborer required. Production rate = 3 hours/mile. Rate for double lane road = single lane x 1.35

Single Lane	\$330
Double Lane	\$445

Compaction, \$/mile: Using roller until visible displacement ceases, minimum 3 complete passes. Double lane cost = single lane cost x 1.35

Single Lane	Double Lane
\$975	\$1320

Water: Estimate under Section 170 (see Complete WO FSSS 170), can be included in Section 303 if specified as indirect.

Constructing New Ditch: Include under Section 204

Erosion Control Measures: Include under Section 157

Clearing and Grubbing: Include under Section 201

Reconditioning Asphalt or Aggregate Surfaces: Costs for reconditioning of asphalt and aggregate surfaces should be estimated using Sections 204, 301, 404, 414, and 430.

Contractor Quality Control: Where applicable, make a subsidiary allowance to this pay item for contractor quality control.

Section 306 - Dust Palliative (Contract Item)

Refer to current dust palliative manufacturer and geotechnical engineering information for detailed information on product characteristics, application rates, estimating procedure, conversion factors and calculations. The following is a summary of essential information.

A. Application Rates. See Application Rate Table below. Rates for lignin sulfonate and chloride products are based on the solid contents shown under C, "Approximate Weight-Volume Factors @ oF", this Section. These products may be furnished with varying amounts of water and if so, adjustments based upon the weight of solids may be necessary on the application rates and payment. Rates will vary depending on the type and condition of the surface and the amount of residual dust abatement material present. For example, more dust abatement material will be required for loose pit-run gravel and less for unsurfaced roads in clay material. Due to leaching of the chloride products, it is recommended that the product be applied slightly narrower in width than the surfacing, particularly along riparian areas.

B. Unit Material Cost. Prices can be extremely variable, particularly for dust oils. Up-to-date quotes should be obtained from local suppliers for each project.

C. Approximate Weight-Volume Factors @ 60°F

Material	Gallons/Ton	Pounds/Gallon
Lignin Sulfonate (50 percent solids, Specific Gravity = 1.26.)	190	10.51
Magnesium Chloride (32 percent solids, Specific Gravity =1.317)	182	10.98
Calcium Chloride (38 percent solids)	171	11.69

D. Shipping Costs. Shipping costs are variable and should be verified for each project by contacting suppliers.

E. Road Preparation. Road preparation costs will depend on the existing surface condition, requirements in other sections such as 322 or 303, and the method specified. See Section 303 for grading costs and Section 170 for watering.

F. Application Cost. Contact supplier for information regarding the cost of application. Supplier will need to know the project location, length of project, width of application, and application rate.

Typical Dust Palliative Application Rates

Type	Initial Application	Subsequent Application
Lignin Sulfonate	0.50 Gallons/Yd ²	0.25 Gallons/Yd ²
Magnesium Chloride Brine	0.35-0.50 Gallons/Yd ²	0.20 Gallons/Yd ²
Calcium Chloride Brine	0.28-0.40 Gallons/Yd ²	0.16 Gallons/Yd ²
Calcium Chloride Flake@77%	1.30-1.90 Lbs/Yd ²	0.75 Lbs/Yd ²

NAME	ADDRESS	PHONE	FAX
MAGNESIUM CHLORIDE SUPPLIERS			
ATLAS SAND AND ROCK	4341 Snake River Ave. Lewiston, ID 83501	208 743-5596	208 746-2530 Mel Goins
LYMAN DUST CONTROL	P.O. Box 243 Spokane, WA 99210	509 999-2000 800 952-6457	Jerry Lyman
SWACO	203 East Main Street Riverton, WY 82501	307 856-9626 Contacts: Mike Wilson	307 856-1852 John Hazlewood
DESERT MOUNTAIN CORPORATION	P.O. Box 1633 Kirtland, NM. 87417	800 375-9264	505 598-0436 Emil Mead
HILL BROTHERS CHEMICAL CO.	75 N. 640 W. N. Salt Lake, UT 84054-2714 Plant - Rowley, UT	801 936-4100 800 336-3911	801 936-4110 Jeff Greenburg
DULTMEIER SALES	13808 Industrial Road Omaha, NE 68137	(402) 333-1444 (800) 228-9666	402-333-5546
NORTH AMERICAN SALT	Ogden, UT	913 344-9390	Jason Bagely

Aggregate Courses

NAME	ADDRESS	PHONE	FAX
CALCIUM CHLORIDE SUPPLIERS			
DESERT MOUNTAIN CORPORATION	P.O. Box 1633 Kirtland, NM. 87417	800 375-9264	505 598-0436 Emil Mead
HILL BROTHERS CHEMICAL CO.	75 N. 640 W. N. Salt Lake, UT 84054-2714 Plant - Rowley, UT	801 936-4100 800 336-3911	801 936-4110 Jeff Greenburg
HYLAND ENTERPRISES INC.	P.O. Box 2377 Rawlins, WY 82301	307 328-0668 800 651-5263	307 328-9800 Doug Dowlin
CARGILL SALT	Farmington, UT	801 557-9967	Steve Cheuvront
DOW CHEMICAL		800 447-4369	Greg MacDonnel
TETRA TECHNOLOGIES		800 327-7817 x350	John May
VITRO CHEMICAL	Humble, TX	281 852-4754	Chuck Hodgdon
TIGER CALCIUM SERVICES, Inc	BC, Canada	780 955-5004 800 661-4298	Clark Sazwan
WARD CHEMICAL	BC, Canada	780 436-4832	Al Korchinski

NAME	ADDRESS	PHONE	FAX
LIGNIN SULFONATE SUPPLIERS			
DESERT MOUNTAIN CORPORATION	P.O. Box 1633 Kirtland, NM. 87417	800 375-9264	505 598-0436 Emil Mead
GEORGIA-PACIFIC WEST, INC	P.O. Box 1236 Bellingham, WA 98227	360 733-4410 800 365-4348	360 676-7217

NAME	ADDRESS	PHONE	FAX
BENTONITE SUPPLIERS			
WYO-BEN, Inc	Lovell, WY	800-548-7055	Rick Zavitz
BLACK HILLS BENTONITE	Worland, WY	800-7889443	
BENTONITE PERFORMANCE MINERALS, INC	Lovell, WY	281-871-7900	Charles McAughan
AMERICAN COLLOID	Lovell, WY	800-322-1159	
M-1 BENTONTITE (USNEWCO)	Greybull, WY	866-299-1464	John Livezey
CENTRAL OREGON BENTONTITE	Oregon	541-477-3351	
TEAGUE MINERAL PRODUCTS	Adrian, OR	541-339-3940	

Section 322 - Minor Aggregate Courses

Note: *If local conditions indicate that aggregate production will be subcontracted, and that aggregate producers will likely pay Davis-Bacon wage rates, no reduction for labor should be made to the basic rock cost. Also, not all contracts require Davis Bacon rates in basic rock and hauling costs. Check with your Contracting Officer.*

The costs shown herein are applicable only for situations closely fitting the stated assumptions. However, the procedure and work items should be considered and estimated for all projects where that type of work is involved. On larger base and surfacing projects of 25,000 cy or more, consideration should be made for additional economies due to the large quantities. Total in place cost for these large jobs will average about 10% less. On the other hand, for small projects of 5,000 cy or less, costs will be at least 20% higher.

Aggregate costs are estimated in the following three categories:

- A. Basic Rock Cost
- B. Load and Apply
- C. Haul

A. Basic Rock Cost (Labor: 45 percent)

The following costs assume a production rate of 150 TPH. Material weighs 2,800 to 3,000 lbs/cy loose. Costs shown are in tons and loose cubic yards. Material Grading C, 1-1/2 inch minus is the basis for rock costs.

1. *Move-in/move-out costs (approximate).* Includes cost to set up and take down equipment. Does not include movement of equipment commonly used on other parts of job. Make cost allowance per instructions under Section 151 (Mobilization).

Table 1

Move-In and Set-Up Typical Costs (approximate ranges only – verify with producers)

Jaw Crusher or Screen	\$11,000 - \$ 12,200
Two-Stage Crusher	\$17,250 - \$ 21,750
Three-Stage Crusher	\$18,700 - \$24,500
Changing Pit Sites	\$1,600 - \$2,400
Changing Screens	\$ 175 - \$ 920
Setup Belt-Scale Operation	\$ 575 - \$1,150
Platform Scale (move-in, setup, ramps, and certification.	\$2,300 - \$3,000

2. *Pit development.* See note after Item 11 on next page.

Aggregate Courses

3. *Royalty charge for private pits.* These are highly variable, costs range from \$.50/CY to \$1.00/CY or higher.

4. *Drilling and shooting costs.*

Normal drilling and shooting: (includes tractor for moving material)	\$1.50/cy loose \$1.05/ton
Breaking oversize	\$5.20/cy loose \$3.60/ton

5. *Ripping, if required.*

\$1.15/cy
\$0.80/ton

6. *Crushing.* For grading other than Grading C, the following multipliers should be applied to crushing costs shown in (a) and (b) below. Grading is based on Complete WO FSSS 322 and 703.05, Tables 703-2, 703-3

Table 2
US Customary (English) Units

Crushed Aggregate								
Max Size (in)	2-1/2"	2"	1-1/2"	1"	3/4"	1-1/2"	1"	3/4"
Grading	A	B	C	D	E	F	G	H
Multiplier	0.9	0.95	1.00	1.10	1.25	0.80	0.9	0.95
Screened Aggregate								
Max Size (in)			6"	6"	4"	4"		
Grading			L	M	N	O		
Multiplier Size Ratio 1.10			0.6	0.7	0.7	0.7		

a. Crushed pit rock (drilling and shooting and/or ripping generally not required)	\$6.10/cy loose \$4.20/ton
	or
b. Crushed quarry rock (includes loading into crusher)	\$7.30/cy loose \$5.00/ton

(If size-ratio requirements are included in the grading, increase crushing costs approximately 10%. If bentonite binder is specified at 2% of aggregate quantity, add \$2.00 per ton to rock cost for projects over 10,000 tons and \$3.00 per ton for smaller projects)

7. *Screening only.*

\$4.50/cy loose
\$3.10/ton

8. *Pit run.*

(no crushing - includes dozer loader, and operators)	\$4.00/cy loose \$2.75/ton
--	-------------------------------

9. *Stockpiling.*

(use only where required by contract or job conditions) \$0.80/cy loose
\$0.55/ton

10. *Weighting.*

10. Weighting: (Platform Scales) \$0.30/ton

11. *Contractor Quality Control.* (If required by contract, add the cost of contract or sampling and testing. See Section 153.)

Estimate pit or quarry development under FSSS Section 651, cost may be included in basic rock cost or as a separate pay item. Costs should include:

1. Clearing, grubbing, and slash cleanup
2. Access roads
3. Conserving topsoil
4. Removal of overburden
5. Ground control and traffic control
6. Restoration
7. Seeding

Production Losses

In computing aggregate costs, one should calculate the total cost of producing the final quantity of aggregate desired. To determine unit costs, the total costs of each major subdivision (basic rock cost, load and apply, and haul) should then be divided by the final desired quantity. By following this procedure, the cost of normal production losses can be included in the unit cost of the final quantity.

The following production losses should be considered:

1. Ongrade process and haul losses - essentially negligible for conscientious operator.
2. Stockpiling losses: Approximately 5 percent; use only if stockpiling required by contract, physical arrangement of pit, or work schedule imposed by contract.
3. Crushing/screening/blasting.
 - a. Quarry operation approximately: 5-10 percent.
 - b. Gravel or rock pit: 20-30 percent

These seemingly high losses result from a high percentage of fines found in such pits. Technically, it is not "lost" material, but "reject" necessitated by gradation requirements. Actual estimate of losses should be based on field tests or experience.

Small Quantities

Increase costs for small projects as calculated above by about 20% for jobs where the quantities are less than 5,000 tons or 3,500 CY.

Aggregate Courses

Basic Rock Cost Example:

Grading D, compact by hauling equipment (From Table 2, apply multiplier of 1.1 to crushing cost).

Quantity required on the road - 10,000 tons

Location: Colorado Zone 1

Assume hard rock quarry with stockpiling and weighing required.

Stockpiling loss - 5 percent

Crushing loss - 10 percent

To obtain 10,000 tons for the road, the contractor will have to drill, shoot, and process approximately 11,500 tons ($10,000 + 15\% = 11,500$ tons).

Contractor will stockpile $10,000 \text{ tons} + 5\% = 10,500$ tons.

Move in-out (includes platform scale) Two stage crusher \$17,250 + Scales \$2300 = \$19,550 - Include under Section 151 - Mobilization.

Drill and shoot $\$1.05 * 11,500$	\$12,075
Crushing and screening $\$5.00 * 11,500 * 1.1$	\$63,250
Stockpiling $\$0.55 * 10,500$	\$5,775
Weighing $\$0.30 * 10,000$	\$3,000
Contractor sampling & testing (lump sum)	\$3,000
Total Cost	\$87,100

Unit basic rock cost = $\frac{\$87,100}{10,000 \text{ tons}} = \$8.71/\text{ton}$

For Colorado Zone 1, the Adjustment Factor for Public Works Davis–Bacon Zones is 0.92 for 45 % labor. (Note: The adjustment factor comes from Table 3 in the Engineer’s Estimate section of this guide)

For all Zones in Colorado , no Adjustment Factor for Equipment Differences is necessary. (Note: The adjustment factor comes from Table 4 in the Engineer’s Estimate section of this guide)

Adjust for Colorado Zone 1, 45% labor; $\$8.71 \times 0.92 = \$8.01/\text{ton}$

B. Load And Apply (Labor = 40 percent)

1. *Loading costs are variable depending on procedures at pit.* These vary depending on loading method, i.e.,

- | | |
|---|---|
| a. from belt - included in basic rock cost. | \$0 |
| b. from hopper - included in basic rock cost. | \$0 |
| c. pit run - included in basic rock cost. | \$0 |
| d. from stockpile. | \$0.64/cy loose(from Section 204)
\$0.44/ton |

2. *Processing with grader.* Depends on aggregate depth and width of road.
\$0.80-\$1.08/cy loose
\$0.55-\$0.75/ton

3. *Compaction (approximate).*
 With hauling equipment (not recommended except for very small jobs where roller mobilization is not warranted) \$0

- | | |
|---|---|
| b. With rollers – minimum 3 complete passes | \$1.06-\$1.32/cy loose
\$0.73-\$0.91/ton |
|---|---|

4. *Watering.* Estimate under FSSS Section 170; water should be indirect to Section 322. Consider allowing for water truck to be available throughout the entire aggregate placing process.

C. Aggregate Haul (Labor = 30-50 percent)

Calculate haul according to the instructions in haul section in Section 204 of this cost guide. These costs are based on loose cubic yards. Use appropriate weight conversion factor to convert to \$/ton-mi. If measurement for payment or credit is on another basis, appropriate adjustment factors must be made.

Haul cost = fixed cost for the truck plus variable haul costs. If Construction Induced Maintenance is needed, it should be included in aggregate haul costs.

Aggregate Courses

Haul Cost Example:

Variable costs of haul based on road characteristics and average round trip travel speed
3.0 miles, 30 mph
6.0 miles, 15 mph
2.5 miles, 10 mph (include distance to turnaround)
Belly dump trucks (20 cy)

Location: Colorado Zone 1, Basis of payment: CY.

Haul Cost = Fixed cost + (variable haul cost x haul distances)

Haul Cost = 1.45 + (0.42 * 3.0) + (0.85 * 6.0) + (1.26 * 2.5) = \$10.96/CY

For Colorado Zone 1, the Adjustment Factor for Public Works Davis–Bacon Zones is 0.94 for 35 % labor. (Note: The adjustment factor comes from Table 3 in the Engineer’s Estimate section of this guide)

For all Zones in Colorado , no Adjustment Factor for Equipment Differences is necessary. (Note: The adjustment factor comes from Table 4 in the Engineer’s Estimate section of this guide)

Adjust for Colorado Zone 1 (35% Labor): $\$10.96 \times 0.94 = \$10.30/\text{ton}$

End of Aggregate Courses

**ASPHALT PAVEMENTS
AND
SURFACE TREATMENTS**

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Section 400 - Asphalt Pavement General

General: Contractor Quality Control and Testing - All allowances shall be subsidiary to other pay items. Generally contractor quality control is applicable for Items 403 through 406, 409, 410, and 412. Contractor sampling is applicable for Items 407, 408, and 413. Refer to "Asphalt Products" (Table 400-3) for suppliers.

Section 403 - Hot Asphalt Concrete Pavement

Estimates should be based upon current local prices, remoteness and size of project, haul distance of materials, adequacy of worksite, etc.

Compare the cost of on-site production with feasible commercial sources in the area. Move-in and move-out costs of a portable plant will often control prices on small projects.

The in-place compacted density and asphalt content used for calculating quantities should be based on a preliminary mix design. In lieu of other information, use 150 pounds per cubic foot for in-place compacted density and 6.5 percent asphalt cement based on weight of total mix.

Contact local State DOT for available mix designs in your area.

Add \$10 to \$15 per ton of asphalt if antistripping additive is required.

Section 409 - Asphalt Surface Treatment

A. Aggregate. Costs are dependent upon quantity and location. Include the following:

1. *Crush and Stockpile:* (FSSS Sections 320 and 322). Crushing costs can vary widely depending on the gradation selected, whether aggregates are produced as a by-product of other crushing operations or produced separately, and availability of commercial sources. Chips average weight is 2300 lbs/cy (loose).

2. *Loading Aggregate:* (use cost from Section 322).

3. *Weighing:* (platform scales), \$0.25/ton. Include cost for scale move-in, set-up and certification, \$2000 - \$2500 per instructions under Section 322. If bin or belt scales are used, allow \$500-\$1000 for certification. For small projects consider using lump sum or cubic yard measurement.

4. *Hauling:* Develop haul cost from haul section in this cost guide

5. *Road Surface Preparation, Brooming & Other Prep Work:* (if required) Estimate the number of passes for power broom. (Travel speed of 5-7 miles per hour). Rough cost \$0.0065/sq. yd.
6. *Aggregate Application:* Include cost of self-propelled aggregate spreader and truck time while waiting and spreading.
7. *Rolling:* Immediately after application of aggregate. Estimate using pneumatic-tired roller (self-propelled).
8. *Traffic control:* Determine if traffic count and type of traffic warrant the need for pilot car and/or flag persons. Special or unusual construction signing should also be considered.
9. *Surface Maintenance:* Determine maintenance and brooming during and at the end of the curing period.
10. *Temporary Centerline Marking:* Price range is \$250.00 to \$350.00 per mile.

B. Bituminous Material. Obtain current quotes from local suppliers (refer to Table 400-3). Asphalt costs are dependent upon quantity and location. Application rates for emulsified and liquid asphalts may be determined by two methods, depending on the type of table used for estimating:

1. *Total Quantities:* Application rates for total quantities are given under Section 409 in the "Application Rate Tables" (Table 400-1) included in this Guide, and no adjustment is necessary, if asphalt emulsions are specified.
2. *Residual Quantities:* Application rates for residual quantities are given in Tables 409-1, 409-2 and 409-3 of the FP-03, Section 403, and actual application rates for cutback and emulsified asphalts are determined by dividing the asphalt residual rates by the percent asphalt from the applicable AASHTO materials specification for the selected type and grade.

Include:

1. Application cost of \$10 to \$15 per ton of bituminous materials for uninterrupted work. Consider location of tanker trucks or temporary storage tank and time to re-fill distributor. Small, irregular areas such as in campgrounds or parking areas should be estimated using hourly rates for a distributor and hand spraying.
2. Add \$10 to \$15 per ton of liquid asphalt for antistripping additive, if required for cutback asphalts.

Table 400-1 - Application Rates

Item	Rate	Remarks
412	0.03 - 0.15 gal/yd ²	Typical rate for tack coat using 1:1 diluted CSS-1 emulsion
411	0.10 - 0.50 gal/yd ²	Typical rate for prime coat using MC-70

C. Bituminous Surface Treatments and Seal Coats Using Emulsified Asphalts.

Application Rates for Total Quantities. No Adjustment is Necessary. For estimating use the highest rates for aggregate and asphalt emulsion shown for the type of treatment desired. Final rates should be determined by testing the aggregate after contract award. Use rock size (gradation) that is similar to local State requirements to obtain more competitive bids. For campgrounds and administrative sites that have a buildup of dirt and pine needles along the shoulder, increase the costs for cleanup.

**Table 400-2
Number & Type
of Treatment**

	Course	Aggregate Grading	Aggregate (lb/yd²)	Asphalt Emulsion (gal/yd²)
No. 1 Single	1	NA	None	0.10 - 0.15
No. 2 Single	1	D	18 - 23	0.25 - 0.30
No. 3 Single	1	C	23 - 28	0.35 - 0.40
No. 4 Single	1	B	28 - 33	0.40 - 0.50
No. 5 Double	1	A	40 - 50	0.55 - 0.65
	2	D	15 - 20	0.25 - 0.30

Section 410 - Slurry Seal

Obtain costs from supplier.

Section 411 - Prime Coat

Obtain current quotes from local suppliers. Asphalt costs dependent upon quantity and location. Application costs are about \$10 to \$15 per ton of asphalt.

For application rates see "Application Rate Tables" (Table 400-1).

For price data see "Asphalt Products" (Table 400-2)..

Section 412 - Tack Coat

Costs dependent upon quantity and location. Application, exclusive of materials, is about \$.20/gallon. Include surface preparation and brooming cost.

For application rates see "Application Rate Tables" (Table 400-1).

For price data see "Asphalt Products" (Table 400-2).

Section 414 - Asphalt Pavement Crack And Joint Sealing

Obtain costs from supplier. If applicable, make allowance for routing the cracks prior to the application of crack sealer.

Section 415 - Paving Geotextiles

Obtain costs from supplier.

Section 430 - Asphalt Pavement Patching

Obtain costs

Table 400-3 - Asphalt Products. Listing of Materials Sources

Name	Address	Phone	FAX
ASPHALT SUPPLIERS			
SemMaterials	Grand Junction, CO Woods Cross, UT Boise, ID Spokane, WA	970 241-1135 801 295-3489 208 345-2538 509 487-4560	970 241-9182 801 295-8349 208 336-0135 509 487-5170
Montana Refining	1900 10th Street N.E. Great Falls, MT 59404	406 761-4100	406 761-0174
Idaho Asphalt Supply	Idaho Falls, ID Salt Lake City, UT California	208 524-5871	208 524-1679
Holly Asphalt	Albuquerque, NM Glendale, AZ	623 385-3657	
Golden Bear Oil Specialities	P.O. Box 5446 Oakdale, CA 93388 6400 Richmar Ave. Las Vegas, NV 89139	661 393-7110 702 361-3700	John Petrilli 702-361-6332
Hills Materials Company	3330 Sturgis Road Rapid City, SD 57702	605 394-3300	
CLARIFIED DUST OIL D0-4 SUPPLIERS			
Idaho Asphalt Supply Inc.	P.O. Box 50538 Idaho Falls, ID 83405-0538	208 524-5871 800 524-1679	208 524-1679
ENZYME and RESIN SUPPLIERS			
Idaho Enzymes, Inc.	1010 West Main Jerome, ID 83338	208 324-3642	208 324-4243
Soil Stabilization Products Company	P.O. Box 2779 Merced, CA 95340	209 383-3296 800 523-9992	209 383-7849

End of Asphalt Pavements and Surface Treatments

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BRIDGE CONSTRUCTION

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Contact the Bridge Design Group in the Regional Office to estimate costs in Section 550. At the present time, historical costs are not adequate for estimating the cost of new bridges.

Region 2: Structural Engineer	Scott Mitchell	303-275-5196
Region 3: Structural Engineer for Region 2	Scott Mitchell	303-275-5196
Region 4: Structural/Bridge Engineer	Tom Gillins	801-625-5236

End of Bridge Construction

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INCIDENTAL CONSTRUCTION

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Section 601 - Minor Concrete Structures (Labor 40 percent)

WO FSSS 601 deletes the entire FP-03 specification, and replaces it with new wording.

Method A or B: Concrete for minor structures (about 30 CY or less). Unit price may vary from \$300 to \$400 per CY, depending upon quantity, distance from concrete source, forming difficulty, etc. Verify costs with local suppliers.

Where applicable, make a subsidiary allowance to this item for contractor quality control.

Method C: Very small quantities of concrete for fence posts, gate post, etc. (no forms required). Cost will be about \$100 - \$200/CY or greater, depending on number of sites, access, etc.

Section 602 - Culverts And Drains (Labor 20-30 percent)

Labor for culverts up to and including 36 inches in diameter and CMPA's up to and including 42 inches by 29 inches: compaction Method A, 30%; compaction Methods B and C, 40-60 %. Labor for larger culverts and CMPA's: 40-60 %. Method A should not be used for these pipe sizes.

Compaction Methods A, B, and C are from WO FSSS 209.11. The unit prices shown in this Section need to be adjusted for the compaction method and quality control as follows:

Compaction Method:

Method A. No adjustment.

Method B. Add in additional \$5/LF. Uses roller until visual displacement ceases

Method C. Add in additional \$15/LF. Uses roller and requires compaction testing T310

Quality Control:

Where applicable, make a subsidiary allowance to this pay item for contractor quality control.

Unit cost for culverts installed in existing roads and pipes installed "after grade" will normally be higher than for pipes in new construction due to the increased amount of excavation. The following installed culvert prices are based on a 40 LF pipe which includes one band and should be used for the condition indicated:

Size	"After Grade" & Reconstruction	
	New Construction	(Shallow Installation)
	\$/ft	\$/ft
18"	\$28.00	\$33.00
24"	\$33.00	\$38.00
30"	\$44.00	\$49.00
36"	\$54.00	\$59.00

Incidental Construction

Increase the above costs by a factor of 1.1 to 1.3 to reflect longer lengths or steepness of side slopes. Estimate larger pipes by time and equipment methods. Following are some items that should be considered under Sections 602 and 209 when estimating installation of larger pipes:

If installation is in a live stream, allow for stream diversion costs under Section 157. Consider diversion pipe, plastic sheeting, sandbags, Sedimats, turbidity curtains, pumps, and potential fish removal. Allow for installation and removal of diversions. If instream work restrictions exist for fish bearing streams, such as work windows relating to migration and spawning, be sure to include the appropriate wording in the contract.

Analyze the cost of materials for different culvert corrugations. Often a lighter metal thickness can be used with the wider corrugations which may result in a savings in materials costs.

Allow costs for metal end sections, culvert end treatments, shop ellipsing, special coatings, and adjustment for pipe arches if required. Call culvert suppliers for quotes.

Estimate the amount of time and equipment required (excavation equipment, compaction equipment, labor, operators, etc.) to excavate and construct the culvert bed including excavation below the invert elevation for removal of unsuitable or unstable material and to bed and backfill the pipe.

If springs, seeps, or underground flows are expected in the culvert area, allowance should be made for filter cloth, drain rock, cutoffs, special bedding, or special backfill material.

The following materials and shop prices are provided as a guide for use in estimating culvert prices. The prices do not include delivery to the job site. Price information is from Contech Construction Products in Boise, Idaho; current as of February 2007. During early 2006, steel prices jumped up twice, but have stabilized since July 2006. Always check current prices with your local supplier when putting together a cost estimate, especially if there is a large quantity of culvert involved. Metal culvert prices listed are for galvanized steel only, as aluminum and aluminized steel culvert is significantly more expensive.

A. Culvert Material Base Prices:

Polyethylene pipe may be suitable for some applications, but shouldn't be used in a forest setting where fire danger may exist, as the pipe will be easily consumed. Typically it is used for stream diversions due to its lighter weight per foot, or in campgrounds where metal pipe is not desired. Cost for poly pipe is higher than for galvanized steel.

Polyethylene Corrugated Pipe 20 Foot Sections	
Double Wall Rigid	
Size inches	Material Cost/ft
12	\$8.54
15	\$16.32
18	\$19.62
24	\$33.58
30	\$53.50
36	\$62.32
42	\$91.02
48	\$115.80

Plastic Pipe Suppliers

Name	Address	Phone	FAX
Advanced Drainage Systems	240 N. 400 W. PO Box 540356 North Salt Lake City 84054	800 821-6710 801 296-2055	801 936-8346
Field Lining Systems	439 S. 3rd Ave. Avondale, Az. 85323	888-382-930 623-842-1255	
Contractor's Supply, Inc	PO Box 1655, Gillette, WY 82717	307 682-5153 800 284-8182	307 682-0356
GJ Pipe & Supply www.gjpipe.com	2868 I-70 Business Loop Grand Junction, CO	970-243-4604 800-748-1564	970-241-6622
Northwest Pipe Fittings, Inc	PO Box 920 Rapid City, SD 57702	605 342-5587 Terry Weber	605 342-0673
See Page 88 for metal pipe suppliers who may also carry plastic pipe.			

Incidental Construction

Galvanized Steel - 2.66"x1/2" Corrugations

Thickness	Pipe Arch	Size inches	Material Cost/ft	Wt/ft (lbs)	Thickness	Pipe Arch	Size inches	Material Cost/ft	Wt/ft (lbs)
0.064 (16ga)		12	\$9.80	10	0.079 (14ga)	21x15	18	\$19.80	18
	17x13	15	\$12.10	12		24x18	24	\$26.15	24
	21x15	18	\$14.40	15		28x20	30	\$32.55	30
	24x18	24	\$19.00	19		42x29	36	\$39.00	36
	28x20	30	\$23.65	24		49x33	42	\$45.40	42
	42x29	36	\$28.40	29		57x38	48	\$51.75	48
	49x33	42	\$33.00	34		64x43	54	\$58.10	54
	57x38	48	\$37.65	38					
0.109 (12ga)	28x20	24	\$36.40	33	0.138 (10ga)	71x47	60	\$115.95	103
	35x24	30	\$42.25	41		77x52	66	\$127.45	113
	42x29	36	\$54.15	49			72	\$138.85	123
	49x33	42	\$63.00	57					
	57x38	48	\$72.00	65					
	64x43	54	\$80.75	73					
	71x47	60	\$89.65	81					
77x52	66	\$98.55	89						

Galvanized Steel - 3"x1" and 5"x1" Corrugations

Thickness	Pipe Arch	Size inches	Material Cost/ft	Wt/ft (lbs)	Thickness	Pipe Arch	Size inches	Material Cost/ft	Wt/ft (lbs)
0.064 (16ga)	60x46	54	\$77.70	50	0.109 (12ga)	60x46	54	\$135.98	83
	66x51	60	\$86.10	55		66x51	60	\$150.68	92
	73x55	66	\$94.50	60		73x55	66	\$165.38	101
	81x59	72	\$103.08	66		81x59	72	\$180.25	110
	87x63	78	\$111.48	71		87x63	78	\$195.13	119
	95x67	84	\$119.88	77		95x67	84	\$209.83	128
						103x71	90	\$224.53	137
0.109 (14ga)	60x46	54	\$97.83	61	112x75	96	\$239.40	147	
	66x51	60	\$108.50	67	128x83	108	\$268.98	165	
	73x55	66	\$119.00	74	142x91	120	\$298.55	183	
	81x59	72	\$129.68	81					
	87x63	78	\$140.35	87	0.138 (10ga)	128x83	108	\$347.90	211
	95x67	84	\$151.03	94		142x91	120	\$386.06	234
	103x71	90	\$161.70	100					
	112x75	96	\$172.38	107					
	117x79	102	\$183.05	114					
	128x83	108	\$193.55	120					

Table Note: Prices listed in the 2 tables above are for helical pipe with locked seams. For annular ring pipe with riveted seams increase the cost per LF by 20%.

Coupling Bands: Equivalent material cost:

For 16, 14, or 12ga. pipe (can all use 16ga band)	Up to and including 48" diameter = 2 LF of 16ga pipe Greater than 48" diameter = 1 LF of 16ga pipe
For 10ga. pipe (need to use at least 14ga band)	Up to and including 48" diameter = 2 LF of 14ga pipe Greater than 48" diameter = 1 LF of 14ga pipe

Watertight gaskets and O-rings: For 1 watertight gasket or a set of O-rings the additional cost is equal to the cost of the band.

Arched pipe: Add 20% to round culvert prices shown in the table above for forming pipe arch. Pipe arches are available only for the culvert with the prices in BOLD print in the table.

B. Culvert Pipe End Treatment. Call for quotes as cost depends upon the angle of the cut and the gage of material.

C. Five percent Shop Ellipse. Call for quotes.

D. Special Coatings. Call culvert distributor for quotes.

E. End Sections (Flared End Terminal Sections). These end sections are available with a trash rack as well if desired to catch debris. End sections can also be acquired for pipe arches, call for material pricing.

Diameter of pipe	Price w/o Rack	Price w/ rack
12	\$85.97	\$114.77
15	\$107.28	\$143.28
18	\$136.58	\$186.96
24	\$196.06	\$282.48
30	\$373.54	\$517.56
36	\$493.78	\$665.28
42	\$823.68	\$1039.68
48	\$1020.82	\$1336.32

Metal Pipe Suppliers

Name	Address	Phone	FAX
Contech Const. Products, Inc	4778 Dorman St. Boise, ID 83705	208 344-2570	208 342-8673
Contech Const. Products, Inc	1935 N. 900 W. Salt Lake City, UT 84116 Eagle, ID (Boise area) Twin Falls, ID Wheatridge, CO Albuquerque, NM	801 363-3873 208 939-3505 208 733-4188 303 431-8999 800 777-7972 505 842-8282 800 522-5237	801 363-3900 208 939-3507 208 734-4928 303 431-0821 505 843-7985
Roscoe Steel and Culvert of Wyoming	7242 W. Yellowstone Highway, Casper, WY 82604 PO Box 1300, Mills, WY 82644	307 472-7121	307 577-4914
Big "R" Manufacturing & Distribution, Inc	PO Box 1290 Greeley, CO 80632	303 893-8480 800 234-0734	970 356-9621
Roscoe Steel & Culvert	2847 Hesper Road Billings, MT 59102-6735 (also offices in Missoula, MT and Casper, WY)	406 656-2253	406 656-8576
Central Culvert Supply	3150 Airport Road, PO Box 103 Pierre, SD 57501	605 224-5222	605 224-9839
GJ Pipe & Supply www.gjpipe.com	2868 I-70 Business Loop Grand Junction, CO	970-243-4604 800-748-1564	970-241-6622

Section 603 - Structural Plate Structures (Labor 20 percent)

Costs do not include the cost of the footing, structural excavation, embankment, or riprap. Each project should be estimated on material, time, and equipment basis. When applicable, make a subsidiary allowance to this pay item for contractor quality control.

Call for quotes on material cost.

Section 604 - Manholes, Inlets, And Catch Basins (Labor 25 percent)

Call culvert manufacturer for prices. Use time and equipment for installation.

Name	Address	Phone	FAX
GJ Pipe & Supply www.gjpipe.com	2868 I-70 Business Loop Grand Junction, CO	970-243-4604 800-748-1564	970-241-6622

Section 605 - Underdrains, Sheet Drains, And Pavement Edge Drains (See items below for labor and reductions)

Perforated pipe cost per lineal foot (Labor 40 percent). Add 12 percent to standard culvert price.

Special sections. Elbows, Wyes, and Tees. Call supplier for current prices.

Porous backfill (filter material) (Labor 10 percent): Develop price from rock costs plus the haul cost as determined from Section 204 of the cost guide. Haul cost to be estimated from the nearest point of manufacture.

Geotextiles (Labor 10 percent): When using geotextiles, the pipe must be placed in freely draining porous material.

Granular underdrain (Labor 25 percent): The cost of granular underdrain is normally on a CY basis, which includes cost of production, loading, hauling, spreading, and compaction. Develop cost by using same criteria as used for Section 301 (screened material).

Sheet Drains (Labor 30 percent): Due to the variable nature of availability, type and gradation of the rock, the different geotextile materials that may be specified, and the different site conditions that may be encountered, this work should be estimated using the "time and equipment" estimating procedures.

LOCAL DISTRIBUTOR	Address	Phone	FAX	TRADE NAME	MANUFACTURER
Nilex Corporation	15171 E. Fremont Dr. Englewood, CO 80112	303 766-2000	303 766-1110		Synthetic Industries
Master Distributors	1600 W. 13th Ave., Denver, CO 80204	303 595-8722	303 893-9161 Rich Minteer	Eljen Drain Polyfelt	Eljen Corporation
Contech Construction Products	N. Salt Lake City, UT 84116 Twin Falls, ID Boise, ID Phoenix, AZ	801 363-3873 208 733-4188 208 344-2570 800 999-8399	801 363-3900 208 734-4928 602 935-6100	Mirafi	Nicolon / Mirafi
Advanced Drainage Systems	240 N. 400 W. PO Box 540356 N. Salt Lake City, UT 84054	800 733-8455 801 296-2055 Jeff Smith	801 936-8346		
US Fabrics	3904 Virginia Ave Cincinatti, OH 45227	800 518-2290	801 936-8346		

Section 606 - Corrugated Metal Spillways (Labor 20 percent)

Use time, material, and equipment.

Round Pipe: If round pipe is used, the unit cost should be about 70 percent of the installed unit cost for the same diameter listed in Section 602 for New Construction, unless difficult slope conditions are encountered.

Elbows: include two connecting bands.

Anchors - Estimate by material and time.

Berm Drain: Unit cost consists of installation of prefabricated 12" diameter corrugated metal catch basin, with slip joint and 20 feet of 8" corrugated metal downspout with downspout anchors.

Flexible Downdrain: lowest price for larger quantity of 200 or more lineal feet.

Inlets: Inlet assemblies are estimated the same as Section 602, End Sections.

Downpipe: Downpipe is measured by the quantity of lineal feet installed including accessories except inlets. Inlet assemblies are measured by the number installed and accepted. Estimates should include gaskets.

Anchors: Anchors are required for downpipes. Anchors should be placed approximately every 10 feet and at the outlet. A culvert anchor installation may consist of stakes and bands or two metal fence posts and wire. The metal fence post culvert anchor may be used for downpipe up to 30" in diameter. 30" diameter pipe and larger will require anchors especially designed for them.

Section 607 - Cleaning, Reconditioning, And Repairing Existing Drainage Structures (Labor 60 percent)

Caution needs to be taken in using this item on metal culverts that have any significant age and or deterioration. Unit price should take into consideration costs related to removing, cleaning, relaying and/or stockpiling pipe.

Excavation for removing pipe should be estimated using time and equipment. Removing, cleaning, and relaying of pipe should cost approximately 60 - 75 percent of the in place price per foot for reconstruction for a given size of pipe as listed in Section 602.

For repairs where a damaged portion of a culvert will be removed and replaced, be sure to match up corrugations, and the type of culvert metal to avoid electrolysis problems. Also include cost for band(s) to join up sections.

Section 609 - Curb And Gutter (Labor 40-50 percent)

Use time, materials, and equipment estimate.

Section 615 - Sidewalks, Drive Pads, And Paved Medians (Labor 40-50 percent)

Use time, materials, and equipment estimate.

Section 617 - Guardrail

Call manufacturer for price quotes on material prices. Contact local State DOT for more information.

When guardrail is required on both sides of the roadway, include the total length of rail on both sides. The length of the rail is determined by measuring the length necessary where it is installed adjacent to the road shoulder, and not from the road centerline length. Also, the length of guardrail is determined by slope distance, not horizontal distance.

Guardrail Suppliers

Name	Address	Phone	FAX
SAN BAR Const. Corp	9101 Broadway Albuquerque, NM 87105	505 452-8000	505 452-8800
Trinity Industries, Inc.	P.O. Box 99 Centerville, UT 84014	801 292-4461 800 772-7976	801 292-2145
Coral Sales Co	PO Box 22385 Milwaukee, OR 97269	800 538-7245	503 657-9649

Section 618 - Concrete Barriers And Precast Guardwalls

Concrete barriers (Jersey) will cost about \$30-\$50 per lineal foot installed.

Call manufacturer for price quotes on material prices.

Concrete Barrier Suppliers

Name	Address	Phone	FAX
CRETEX Concrete Products	2046 Samco Rd. Ste. 2 Rapid City, SD 57702	605 718-4111	
Beauregards, LLC	Boise, ID	208 860-5626	

Section 619 - Fences, Gates And Cattle Guards

Use this specification only for facilities being built for campgrounds and rights-of-way. Use FSSS 650 for Road closure Devices.

Fences: (Labor 60 percent) Four strand barbed wire
Estimate by time, equipment and material. Costs average about \$4.00/LF (\$13.12/m) for fencing.

Gates: (Labor 15 percent metal gates, 65 percent wire gates)
Costs range from \$1,500 to \$3,500 each for double-lane metal gates, and \$1,200 to \$1,700 each for single-lane metal gates. Wire gates cost about \$100 to \$200 each. Powder River type gates cost from \$300 to \$500 each.

Cattleguards: (Labor 10 percent) Prices include wings and base.
Costs range from \$3,500 to \$5,000 for 16'-0 width cattle guard.

Cattleguard, Steel Decked with HS20-44 Loading

Cost Adjustment Factors				
12'-0"	14'-0'	16'-0"	24'-0"	28'-0"
0.75	0.9	1.0	1.5	1.75

Precast concrete base weighs approximately 5,250 pounds/side (2,381 kg/side).

Suppliers

Name	Address	Phone	FAX
Powder River Co.	388 E. 900 S., P.O. Box 50758 Provo, Utah 84605	801 374-2983 800 453-5318	801 377-6927 Ross Gull
Big "R" Manufacturing & Distribution, Inc	PO Box 1290 Greeley, Colorado 80632	970 356-9600 800 234-0734	970 356-9621
Hueys Metal Service Center	P.O. Box 377 Corona, NM 88318	505 849-8446	505 849-4777
WW Cattle Guards & Precast	5742 Webb Dr. Lakeside, AZ 85929	928 537-3125	520 -537-1698 Bob Sebring
Cow Country	4501 S. Interstate 90 Service Rapid City, SD 57703	605 342-8258	
Colorado Correctional Industries (Dept. of Corrections)	P.O. Box 1600, Cañon Complex Cañon City, CO 81215-1600	719-269-4540	Dave Pagnotta

Section 621 - Monuments And Markers (Labor 25 percent)

Estimate by time, equipment, and material.

Section 622 - Rental Equipment

Total equipment rental cost includes the equipment rate and the operator rate. The figures shown in this section are for equipment rates only. Operator rates are not included but can be found in the labor rates section. The equipment rates include fuel, oil, lubrication, repairs, maintenance, and insurance. The cost of moving most equipment to the job is included in Section 151 - Mobilization. *Profit and overhead charged to equipment are included herein (10 percent).*

The rates shown herein were derived from the *Rental Rate Blue Book For Construction Equipment*. The models shown should be considered typical and their rates can be applied to similar equipment. Local rates should be used if local equipment is generally available at a rate different than those shown herein.

For rates not shown in Table 622, estimator should refer to Blue Book equipment rates and correct procedures for location factors. For work lasting 40 hours or less, the base rate is determined by dividing the Blue Book daily rate by eight. For work lasting over 40 hours, the base rate is determined by dividing the Blue Book monthly rate by 176. The rates shown herein (Table 622) are for work in excess of 40 hours.

Location factors from the Blue Book have been applied to the rates in Table 622. They reflect the variations between National averages and local conditions caused by the differences in topography, construction seasons, and the costs of labor, freight, taxes, etc. The location factors vary hence the Estimator needs to select the rate under the state where the project resides.

The use of brand names is for the ease of identification of the type and size of equipment and does not constitute an endorsement of any product. Some models listed are no longer manufactured or were not manufactured during the time period under which they are classified.

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**Table 622 - Rental Rates (Cost/Hr w/o Operator) (2008 Blue Book + 10 % profit)
AIR COMPRESSORS, PORTABLE, RECIPROCATING:**

Includes hose and fittings, diesel powered.

Hourly Rates (\$)			
Cubic Feet per minute	AZ, ID, NM, UT	CO, KS, NE	CA, NV, SD, WY
100	9.07	9.21	9.45
185	16.37	16.53	16.84
300	28.53	28.87	29.51
600	54.69	55.23	56.25
900	63.08	63.81	65.17
1300	94.29	95.31	97.21

ASPHALT PAVER: Diesel powered			
Model	Hourly Rate (\$)		
	AZ, NM, UT	CO, KS, NE, NV	CA, ID, SD, WY
Blaw-Knox diesel 8' Wheel PF-161	145.42	154.53	163.50
Blaw-Knox diesel 10' Wheel PF-3172	172.38	182.95	193.34
Barber-Greene diesel 8' Crawler BG-225C	183.45	194.23	204.84

ASPHALT PRESSURE DISTRIBUTOR: Includes diesel powered truck with full circulating spray bar, heater, insulation, power takeoff unit, and tachometer.

Truck	Capacity Gallons	Hourly Rate (\$)		
		AZ, NM, UT	CO, KS, NE, NV	CA, ID, SD, WY
4x2 - 200 HP	1600	58.85	61.47	63.97
6x4 - 310 HP	3100	87.14	90.59	93.81
6x4 - 380HP	4,000	93.61	97.24	100.63

BACKHOE: diesel powered, standard 24" bucket, EROPS, Extend-a-Hoe:

Model	Digging Depth Feet	Hourly Rate (\$)		
		AZ, ID, NM, UT	CO, KS, NE, NV	CA, SD, WY
Deere 310G -2WD	14' - 5"	30.51	31.66	33.16
Case 580 Super M - 4WD	17' - 6"	38.64	40.11	42.01
Deere 410G - 4WD	16' - 1"	43.23	44.92	47.12
Cat 430D IT - 4WD	19' - 6"	43.92	45.61	47.81
Cat 446B - 4WD	21' - 2"	56.64	58.88	61.78
Deere 710G - 4WD	17' - 10"	70.57	73.52	77.34

BROOMS AND SWEEPERS: Pull Type requires truck to pull(not included in costs below)

Type	Width	Hourly Rate (\$)		
	Feet	AZ, NM, UT	CO, ID, KS, NE	CA, NV, SD, WY
Pull type - traction driven	7	8.71	9.02	9.57
Pull type - gas engine driven	7	13.85	14.23	14.89
Self propelled - diesel RC-350	8	24.31	24.81	25.65
Self propelled - diesel RJ-350	8	24.81	25.30	26.15

BRUSH CHIPPERS: Trailer mounted:

Model	Max Log Diameter	Hourly Rate (\$)		
	Inches	AZ, NM, UT	CO, ID, KS, NE	CA, NV, SD, WY
Mitts & Merrill K12F6 125 HP - gas	8	35.05	35.65	36.68
Bandit 150XP 119 HP - gas	12	34.44	35.06	36.11
Bandit 280 119 HP - gas	18	37.28	38.02	39.28
Bandit 150XP 110 HP - diesel	12	32.43	33.13	34.33
Bandit 280 125 HP - diesel	18	36.26	38.83	40.29

BRUSH CUTTERS: Rubber tired, diesel:

Model	Cutter Width	Hourly Rate (\$)		
	Feet	AZ, NM, UT	CO, ID, KS, NE	CA, NV, SD, WY
Kershaw 800-2 185 HP	8	134.09	137.84	144.26
Kershaw 1200 225 HP	10	153.09	157.35	164.65

CLAMSHELL: Crawler mounted, diesel powered:

Model	HP	Bucket Size CY	Hourly Rate (\$)					
			without bucket			with HD Square nose bucket		
			AZ, ID, NM, UT	CO, KS, NE, NV	CA, SD, WY	AZ, ID, NM, UT	CO, KS, NE, NV	CA, SD, WY
American 5220	125	2	5720.1 9	5723.9 4	5730.1 1	5728.75	5732.82	5739.5 4
Northwest 70-D/7060	232	3	169.11	174.23	182.68	179.82	185.34	194.46

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CRANES: Rough Terrain, Hydraulic, self-propelled, diesel powered:

Model	Capacity	Max Reach	Hourly Rates (\$)		
			TON	Feet	AZ, ID, NM, UT
Bronerson RT300-2BO 4x4x4	18	60	76.99	78.92	81.71
Grove RT58E 4x4x4	25	75	81.55	83.61	86.59
Grove RT525E 4x4x4	30	95	83.44	83.44	88.59
Grove RT700E 4x4x4	50	110	129.62	132.67	137.10

COMPACTORS: Static, self-propelled, diesel powered, tandem:

Model	Capacity	Hourly Rate (\$)		
		Tons	AZ, ID, NM, UT	CO, KS, NE, NV
Bomag BW5AS	6.5	27.81	28.72	30.13
Ferguson 5-8B	9	29.65	30.45	31.70
Ferguson 8-12B	12.5	32.35	33.26	34.68
Ferguson 10-14B	14	33.01	33.95	35.41

Vibratory, self propelled, diesel powered, tandem:

Model	Drum Width	Hourly Rate (\$)		
		Inches	AZ, ID, NM, UT	CO, KS, NE, NV
Bomag BW100AD-3	39	22.39	23.13	24.27
Bomag BW161AD-2	66	68.36	70.68	74.30
Dynapac CC622	84	75.32	77.89	81.88

Rubber tired, pull type, static:

Model	Wheels	Capacity	Hourly Rate (\$)		
			Tons	AZ, ID, NM, UT	CO, KS, NE, NV
Hercules PT-9	9	9.6	15.13	15.70	16.57
Hercules PT-11	11	13	15.93	16.53	17.46
Hercules PT-13	13	17	17.55	18.21	19.25

Rubber-tired, self propelled, diesel powered, static:

Model	Wheels	Hourly Rate (\$)		
		AZ, ID, NM, UT	CO, KS, NE, NV	CA, SD, WY
Ferguson SP912	9	34.36	35.51	37.30
Ferguson SP1118	11	38.38	39.74	41.85
Caterpillar PS200B	9	46.85	48.50	51.07
Ferguson SP1130	11	57.33	59.37	62.56
Sakai TS650C	7	66.41	68.84	72.62

Sheepsfoot, self propelled, single drum, vibratory:

Model	Drum Width	Hourly Rate (\$)		
	Inches	AZ, ID, NM, UT	CO, KS, NE, NV	CA, SD, WY
Bomag BW166PDH-3	66	42.91	44.07	45.87
Bomag BW213PDBH-3	84	69.92	71.74	74.56

Handheld, vibratory plate compactors

Model	HP	Hourly Rate (\$)		
		AZ, ID, NM, UT	CO, KS, NE, NV	CA, SD, WY
21", Gas, reversible	6	6.71	6.90	7.19
25", Gas, reversible	9	10.43	10.73	11.19
13.5"x17" Gas Rammer	4.5	5.64	5.80	6.06

DRILLS: Mobile air track: (with drill and feed)

Model	Max Hole Size	Hourly Rate (\$)		
	Inches	AZ, ID, NM, UT	CO, KS, NE	CA, NV, SD, WY
Ingersoll-Rand Rotary CM345/EVL130	4	45.73	46.93	49.16
Sullivan-Palatek Pneumatic VCR-360	4	51.63	53.00	55.57

GRADERS, Motor: (Basic machine plus EROPS and rear scarifiers):

Model	Engine	Moldboard size	Hourly Rate (\$)		
	HP	Feet	AZ, NM, UT	CO, ID, KS, NE, NV	CA, SD, WY
Caterpillar 120H	125	12	58.67	60.99	64.00
Caterpillar 12H	145	12	67.04	69.70	73.16
Deere 770C	155	12	67.17	69.64	72.86
Caterpillar 14H	220	14	116.55	121.62	128.20
Caterpillar 16H	285	16	153.26	160.11	169.00

HYDRAULIC EXCAVATORS: Crawler mounted tractor, diesel powered:

Model	Capacity	Weight	Hourly Rate (\$)		
	Cubic Yards	Tons	AZ, ID, NM, UT	CO, KS, NE, NV	CA, SD, WY
Caterpillar 312C L	0.68	14	67.68	69.84	73.39
Caterpillar 315C L	0.77	18	78.84	81.29	85.32
Caterpillar 320C L	1.25	23	105.75	109.10	114.61
Caterpillar 325BL	1.25	30	116.98	120.50	126.31
Caterpillar 330BL	2.25	38	136.55	140.52	147.06
Caterpillar 345BL II	2.50	49	192.45	198.18	207.64
Caterpillar 365BL	3.60	75	242.89	249.91	261.50
Caterpillar 385L	5.00	94	316.80	325.90	340.93

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MINI - HYDRAULIC EXCAVATORS: Crawler mounted tractor, diesel powered:

Model	Capacity	Hourly Rate (\$)		
	Cubic Yards	AZ, ID, NM, UT	CO, KS, NE, NV	CA, SD, WY
Deere 17ZTS(ROPS)	0.05	10.75	11.06	11.58
CAT 302.5(EROPS)	0.07	15.95	16.42	17.21

LOADERS:

Crawler type, diesel powered, with EROPS:

Model	Bucket Size	Hourly Rate (\$)		
	Cubic Yards	AZ,NM,UT	CO,ID,KS,NE,NV	CA,SD,WY
Caterpillar 933C	1.30	41.72	43.33	45.42
Deere 555G	1.50	51.52	53.56	56.21
Caterpillar 953C	2.42	84.96	88.76	93.68
Caterpillar 963C	3.20	110.46	115.20	121.34
Caterpillar 973C	4.19	161.25	168.29	177.42

Wheel type, diesel powered, articulated, 4-wd, with EROPS:

Model	Bucket Size	Hourly Rate (\$)		
	Cubic Yards	AZ,NM,UT	CO,ID,KS,NE,NV	CA,SD,WY
Caterpillar 906	1.00	27.60	28.58	29.84
Caterpillar IT14G	1.70	38.46	39.89	41.74
Case 721C	2.50	48.74	50.48	52.74
Caterpillar 950G Series II	4.00	59.40	61.61	64.46
Caterpillar 966G Series II	5.00	84.32	87.62	91.90
Caterpillar 980G Series II	7.00	114.29	118.65	124.30
Caterpillar 988G Series II	8.20	170.28	176.84	185.35

Skid steer type, diesel powered:

Model	Hourly Rate (\$)		
	AZ,NM,UT	CO,ID,KS,NE,NV	CA,SD,WY
Bobcat 753 - 43.5 HP	21.48	22.29	23.34
CASE 435 - 72 HP	29.19	30.27	31.66

PUMPING UNITS (Trash): Portable, tire mounted, self priming, air cooled, diesel:

PumpSize	Engine	Pump Capacity	Hourly Rate (\$)		
Inches	Type	gallons/hr	AZ,ID,NM,UT	CO,KS,NE	CA, NV,SD,WY
2	Gas	10,000	6.24	6.35	6.58
3	Gas	18,000	9.41	9.58	9.90
4	Gas	36,000	12.36	12.60	13.07
6	Gas	90,000	50.73	51.48	52.93
8	Diesel	125,000	46.25	47.53	49.97
10	Diesel	160,000	58.52	60.12	63.19

Note: Unit costs include 25' of suction and 200' of discharge hose with couplings.

SAWS - Chainsaw:

Bar Size	Engine	Hourly Rate (\$)		
	cu.in.	AZ,ID,NM,UT	CO,KS,NE	CA, NV,SD,WY
14 inch	2	1.78	1.80	1.85
16 inch	4	2.64	2.68	2.74
20 inch	6	3.64	3.70	3.79
25 inch	8	4.59	4.67	4.80

SCRAPERS: Single engine conventional, diesel powered (includes EROPS):

Model	Capacity	Hourly Rate (\$)		
	CY	AZ,NM,UT	CO,ID,KS,NE,NV	CA,SD,WY
Caterpillar 621F	14-20	146.91	152.13	158.89
Caterpillar 631G	24-34	256.64	266.66	279.66
Caterpillar 651E	32-44	295.99	307.78	323.07

SCRAPERS: Dual engine conventional, diesel powered (includes EROPS):

Model	Capacity	Hourly Rate (\$)		
	CY	AZ,NM,UT	CO,ID,KS,NE,NV	CA,SD,WY
Caterpillar 637G	24-34	330.17	342.27	357.96

SIGNS, Message: trailer mounted, changeable "DOT"

Model	Hourly Rate (\$)		
	AZ,NM,UT	CO,ID,KS,NE	CA,NV,SD,WY
Solar	7.68	8.08	8.77
Diesel 5 hp	11.35	11.81	12.60

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SKIDDERS, Cable:

Model	Engine	Hourly Rate (\$)		
	HP	AZ,NM,UT	CO,ID,KS,NE	CA,NV,SD,WY
Caterpillar 525B	160	94.06	96.78	101.44
Deere 540G III	117	70.44	72.57	76.22
Caterpillar 535B	180	104.76	107.82	113.08
Deere 640G III	185	99.19	102.00	106.83

SKIDDERS, Grapple:

Model	Grapple Opening	Engine	Hourly Rate (\$)		
	Inches	HP	AZ,NM,UT	CO,ID,KS,NE	
Timberjack 360D SA	85	119	67.34	69.30	72.67
Caterpillar 525B	120	160	101.11	104.09	109.21
Deere 648G III	115	160	100.08	103.02	108.06
Deere 748G III	123	171	108.84	112.10	117.68

SPREADERS, AGGREGATE:

Model	Width	Engine	Hourly Rate (\$)		
	Feet	HP	AZ,NM,UT	CO,ID,KS,NE	CA,NV,SD,WY
Etnyre Chip Spreader	10	152	73.20	74.95	77.95
Rosco Spreadpro	16.5	205	124.27	128.01	134.42
Tail gate w\auger, gas	8	n/a	6.26	6.35	6.50
Towed w\auger gas	7	n/a	4.04	4.12	4.26

TRACTORS, CRAWLER: Power shift/torque converter, Blade, EROPS:

Model	Engine HP	Hourly Rate (\$)			Hourly Rate (\$)		
		w/o Rippers			w/Rippers		
		AZ,NM, UT	CO,ID,KS,NE, NV	CA,SD,W Y	AZ,NM,UT	CO,ID,KS,NE, NV	CA,SD, WY
Caterpillar D3G XL	70	45.41	47.16	49.42	51.02	53.00	55.57
Caterpillar D4G XL	80	51.25	53.27	55.89	56.85	59.11	62.04
Caterpillar D5G XL	90	54.05	56.16	58.91	60.19	62.57	65.67
Caterpillar D5N XL	120	67.94	70.64	74.14	74.08	77.05	80.90
Caterpillar D6R Series II	165	86.40	89.82	94.25	95.29	99.12	104.09
Caterpillar D7H DS	240	122.10	127.13	133.65	135.71	141.40	148.78
Caterpillar D8R Series II	307	159.70	166.33	174.92	181.09	188.76	198.70
Caterpillar D9R	410	208.40	216.87	227.85	235.05	244.85	257.57
Caterpillar D10R	574	277.76	289.03	303.64	306.72	319.46	335.97
Caterpillar D11R	850	472.25	492.50	518.75	517.29	539.92	569.27

TRUCKS:

Pickups and flatbeds:

Axle Configuration	GVW Pounds	Hourly Rate (\$)		
		AZ,ID,NM,UT	CO,KS,NE,NV	CA,SD,WY
4x2 gasoline 1/2 Ton PU	6000	13.13	13.31	13.58
4x2 gasoline 1 Ton PU	8500	24.06	24.32	24.68
4x4 gasoline 1 Ton PU	8500	24.92	25.21	25.64
4x2 diesel flatbed	15,000	22.88	23.24	23.77
4x2 diesel flatbed	25,000	25.87	26.36	27.07
6x4 diesel flatbed	40,000	37.53	38.24	39.28

Rear dump, highway type, diesel powered:

Axle Configuration	Capacity Cubic Yards	Hourly Rate (\$)		
		AZ,ID,NM,UT	CO,KS,NE,NV	CA,SD,WY
4x2	5-6	33.99	34.59	35.47
6x4	8-10	53.05	53.91	55.16
6x4	10-12	66.21	67.30	68.89
6x4	12-18	72.59	73.90	75.82

Articulated Rear dump, diesel powered:

Model	Capacity Cubic Yards	Hourly Rate (\$)		
		AZ,ID,NM,UT	CO,KS,NE,NV	CA,SD,WY
Caterpillar 725	14.5-18.8	101.61	104.97	109.87
Caterpillar 730	17.1-22.1	109.88	113.46	118.67
Caterpillar 735	19.3-25.8	126.15	130.30	136.34
Caterpillar 740	22.8-30.0	139.31	143.88	150.55

Incidental Construction

Water tankers, highway:

Fuel	Capacity		Hourly Rate (\$)		
		Gallons	AZ,ID,NM,UT	CO,KS,NE,NV	CA,SD,WY
Gasoline		1500	35.59	36.10	36.84
Gasoline		2500	36.62	37.17	37.98
Diesel		2500	28.57	29.15	30.01
Diesel		3000	34.37	35.07	36.09
Diesel		3500	44.88	45.74	46.99
Diesel		4000	52.29	53.47	55.20

Water tankers, off highway, diesel:

Fuel	Capacity		Hourly Rate (\$)		
		Gallons	AZ,ID,NM,UT	CO,KS,NE,NV	CA,SD,WY
Diesel		5000	70.39	72.09	74.57
Diesel		6000	119.78	122.47	126.40
Diesel		8000	179.25	183.51	189.72

Truck tractor w/hydraulic gooseneck lowboy trailer (tandem axle):

Axle Configuration	Capacity		Hourly Rate (\$)		
		tons	AZ,NM,UT	CO,ID,KS,NE	CA,NV,SD,WY
75,000 GVW Truck		35	78.92	80.67	83.30
75,000 GVW Truck		50	82.68	84.60	87.50

Truck tractor w/single-gate belly dump trailer (tandem axle):

Capacity		Hourly Rate (\$)		
Cubic Yards	tons	AZ,NM,UT	CO,ID,KS,NE	CA,NV,SD,WY
18	27	76.52	78.21	80.73

WELDERS: Portable (diesel), mounted on skid:

Amps	Hourly Rate (\$)		
	AZ,ID,NM,UT	CO,KS,NE	CA,NV,SD,WY
DC-CC 300	13.49	13.56	13.67
DC-CC 400	18.92	19.01	19.16

Section 624 - Top Soiling (Labor 50 percent)

Topsoil needed on disturbed areas of back slopes and fill slopes to establish vegetation will be estimated from a known source before the contract is awarded. Include the following in cost estimates:

- Loading costs - Use time and equipment.
- Spread - Use time and equipment.
- Haul - see Haul Section in this cost guide.
- Clearing and development of pit area - see Section 651.

The cost of pit development must be included if Section 651 is not included. Elements to consider are move-in costs of equipment needed to clear pit area, cost of clearing and disposal, shaping-up of pit after use, planting and seeding after use, purchase price for topsoil on other than USFS land, etc.

Section 625 - Turf Establishment (Labor: Dry Method = 30-40%, Dry Method W/Mulch = 60%, Hydraulic Method=40-50%)

***Note:** The costs for seeding and fertilizing are based on applying seed and fertilizer in one application. There are no allowances in the costs for watering or compacting the seedbed. If you include these requirements an additional allowance will have to be made.*

Cost for Dry Method is about \$450/acre; cost for Hydraulic Method is about \$3,000/acre. Cost of fertilizer, where required, should be included in the base item. Fertilizer, Section 625.06, should be used only for supplemental applications.

If Native Grass Seed is required, get a quote from a supplier.

Section 629 - Rolled Erosion Control Products And Cellular Confinement Systems

Costs for erosion control blankets and netting range from \$2 to \$4 per SY installed.

Suppliers:

Name	Address	Phone	Fax	Contact
Geo Products	8615 Goldon Spike Ln Houston, TX 77086	281 820-5493	281 820-5499	Al Florez
Soil Stabilization Products Co.	PO Box 2779 Merced, CA 95340	209-383-3296 800-523-9992	209 383-7849	Samuel Randolph
North American Green	14649 Highway 41 North, Evansville, IN 47725	1-800-722-2040		
Terra Tech, LLC	2635 W. 7th Place, Eugene, OR. 97402	1-800-321-1037	1-800-933-4569	

Section 633 - Permanent Traffic Control (Labor 60 percent)

Costs below are for planning purposes only. Call suppliers for current pricing.

Materials	Price
Wood Post	\$1 to \$3/Lineal Ft
Steel Post	\$1.20/Lineal Ft
Signs	\$50 to \$100/Ea
Route Markers	\$15 to \$25/Ea
Aluminum Sign Panels	\$15/Sq Ft
Fiberglass Sign Panels	\$15/Sq Ft
Wood Sign Panels	\$15/Sq Ft
Regulatory/Warning Signs	\$40 to \$120/Ea
Sign and Post(s)	\$60 to \$150/Ea
Delineators w/ posts	\$10 to \$15/Ea
Delineator only Double Sided	\$10 EA

Install Only	Price
Sign and Post (one)	\$20-\$40/Ea

Costs must be increased if sign posts are to be installed in rocky fills or other situations requiring difficult excavation.

Suppliers:

Name	Address	Phone	Fax	Contact
Summit Signs & Supplies	2340 Deadwood Ave Rapid City, SD 57702	605 342-8303		
P & M Signs Inc (GSA contract)	Mountainair, NM	505 847-2850		
Newman Signs	1606 6th Ave SW Jamestown, ND 58402	800 437-9770		
UNICOR Sign Factory	9595 W. Quincy Ave Littleton, CO 80123	303 763-2588	303 763-2526	Karla Kunsemiller
Stonehouse Signs (GSA: GS-07F- 5550P)		800 525-0456 Ext. 205	303 467-1382	Patty Preston
Perma Letter Sign Co.	1105 4th Ave. N. Billings, MT 59101	406 252-1102		Ronald A. Bachman
Signs of Orion	Bozeman, MT	406 599-0382	406 586-2797	Chris

Section 634 - Permanent Pavement Markings (Contract Item)

Costs can be estimated on the basis of the gallons of paint required including the cost of glass beads, paint, cleaning surface to be painted, application, and protection of markings until dry. Estimator should use designed lengths of single solid, single dashed, and double solid to make estimate; or time, equipment, and materials. Campground and parking area striping will cost more due to the short lengths, intermittent markings, and tighter working areas.

See Section 634 for application rates for paint and beads.

Contact suppliers for current costs. Contact local State DOT for contractors:

Suppliers:

Name	Address	Phone	Fax	Contact
Emery Brothers	21357 Highway 30 Filer, ID	208 733-3951		
Pavement Markings Northwest	4850 Henry St. Boise, ID	208 388-8858		
Idaho Traffic Safety	3400 E. Sunnyside St. Ammon, ID 83406	208 522-4470		
TAPCO	800 Wall St. Elm Grove, WI 53122	800 236-0112		

Section 650 - Road Closure Devices

Labor: Metal Gates - 15 percent
 Concrete Barriers - 10 percent ----- Call for quotes.
 Guardrail Barriers - 30 percent

Costs range from \$1,500 to \$3,500 each for double-lane metal gates, and \$1,200 to \$1,700 each for single-lane metal gates..

Estimate by time, equipment and material.

Suppliers:

Name	Address	Phone	FAX
Powder River Co.	388 E. 900 S., P.O. Box 50758 Provo, Utah 84605	801 374-2983 800 453-5318	801 377-6927 Ross Gull
Big "R" Manufacturing & Distribution, Inc	PO Box 1290 Greeley, Colorado 80632	970 356-9600 800 234-0734	970 356-9621
Hueys Metal Service Center	P.O. Box 377 Corona, NM 88318	505 849-8446	505 849-4777
WW Cattle Guards & Precast	Route 4, Box 1756 Lakeside, AZ 85929	520 537-3125 800 845-3234	520 -537-1698 Bob Sebring
Cow Country	4501 S. Interstate 90 Service Rapid City, SD 57703	605 342-8258	

Section 651 - Development Of Pits And Quarries (Labor percent and reduction as per sections used in estimating)

A. Clearing, grubbing, and slash clean-up should be estimated as recommended for Section 201, include additional allowance for difficult terrain.

B. Access roads may be estimated as lump sum based upon equipment and labor hours or unit prices for construction items as covered in Section 204. Pay particular attention to materials and terrain encountered in access road construction that will affect cost of construction.

C. Quarry stripping, slope rounding, restoration, and clean-up should be estimated as lump sum based upon equipment and labor hours or unit prices for construction items as covered in Section 204.

D. Turf establishment may be estimated per instructions in Section 625.

E. Ground and traffic control estimated per requirements in Section 635.

If Section 651 is not included in the contract, development costs should be included in the items requiring the pit or quarry. Estimator should pay close attention to requirements shown on the pit development plan.

End of Incidental Construction

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**TEMPORARY ROAD
COST ESTIMATING**

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Cost Estimating For Temporary Roads

The decision to construct temporary roads for a timber sale or other activity is based on transportation planning and resource objectives that are documented in a NEPA decision. Temporary roads generally are built for one or two seasons of use for limited traffic. The National Forest Management Act (NFMA) requires that any temporary road built as part of a timber sale or other permit/lease shall be designed with the goal of reestablishing vegetative cover on the roadway and adjacent disturbed area within ten years after the termination of the contract, permit, or lease. In addition to this NFMA requirement, the timber sale contract requires outsloping, removal of culverts and ditches, and building water bars or cross ditches after the road is no longer needed.

Per FSH 2409.18 – Timber Sale Preparation Handbook, under Chapter 45.36d: “Coordinate closely with the local engineering staff to develop the cost of temporary roads or other temporary development identified in the timber sale contract. Estimate the costs of all temporary roads, using cost data contained in zone or regional cost guides and schedules.”

The responsibility for the accuracy of temporary road cost estimates in some Regions may rest with the Forest Engineer. Check for additional guidance contained in regional supplements, if any. Following the example estimate in this section is a sample form for documenting temporary road costs estimates.

The following procedure, or an estimate by time and equipment, should be used to develop temporary road costs that will be included in the timber sale appraisal. If time and equipment methods are used, the estimator should use the labor rates and equipment rental rates contained in this Cost Guide. The labor rates need to be adjusted per section entitled Davis-Bacon/Purchaser Wage Rate Adjustments which appear earlier in this publication.

Step 1: Using Table T-1, determine the quantity in acres for clearing and grubbing based on the average sideslope of the temporary road. Calculate the cost per mile by multiplying the quantity by the clearing unit cost per acre from Figure 201-1. Select the unit cost based on the average timber volume per acre (MBF/Acre). Apply the appropriate topographic factors Section 201.

Adjust the cost per mile for Davis-Bacon work zones using Table 3 in the Engineer’s Estimate section. Adjust for Purchaser wage rate if applicable using the Purchaser Cost Adjustment Factor for Wage Differentials table in the Davis-Bacon/Purchaser Wage Rate Adjustment section of this guide.

The timber sale appraisal makes cost allowances for felling, bucking, and skidding for temporary roads so these costs from must be removed from the clearing cost calculated here. Contact the Timber staff responsible for the timber sale to obtain the appropriate costs to remove. Also, the timber staff should have the volume per acre data as well. If additional clearing width is desired for windrow placement, etc., make necessary cost allowances. Make adjustment for the method of slash disposal used.

Step 2: Using Table T-1, determine excavation quantity per mile based on the average sideslope for the temporary road. Calculate the cost per mile by multiplying the quantity by the base cost per CY for excavation from Section 204. Make adjustments for type of excavation material, if any. If turnouts or turn-arounds are desired, adjust excavation costs accordingly (See Section 212).

Step 3: Using Table T-1, determine seeding quantity per mile based on the average sideslope for the temporary road. Calculate the cost per mile by multiplying the quantity by the unit cost per acre of the turf establishment method used. (See Section 625). The quantities listed for seeding includes the roadbed and all slopes.

Step 4: Determine the cost of obliteration using Section 211. This item should be included in every temporary road.

Step 5: Total the unit per mile costs determined in Steps 1-4.

Step 6: Multiply unit cost from Step 5 by the length of the temporary road(s).

Step 7: Determine the total cost of drainage structures from the appropriate sections of this guide:

Step 8: Add the costs determined in Steps 6 & 7. Add an allowance of 7% for Mobilization.

Step 9: Remove Profit allowance by dividing the total in Step 8 by 1.10.

Temporary Road Example:

Location: Idaho Zone 2
Average side slope: 30 percent
Estimated length: 1.5 miles
Timber volume: 20 MBF/acre
Drainage structures: 3 drain dips
 1 - 18" x 40' culvert
 1 - 24" x 36' culvert
Obliteration: outslope and rip roadbed
Solution:

Step 1: From Table T-1, Clearing and grubbing = 2.11 Acres/Mile. Unit cost from Section 201, Figure 201-1, for 20 MBF/acre = \$2500/acre. Percent labor = 40%. Adjustment factor for Davis-Bacon wages from Table 3 in the Engineer's Estimate section for Idaho Zone 2 = 1.02. Adjustment factor for Purchaser wage rate adjustment from the Purchaser Cost Adjustment Factor for Wage Differentials table = 0.82. Topographic factor from Section 201 for 30%

sideslope = 1.0. The cost allowance for felling, bucking, and skidding, from the Timber staff = \$76.50/MBF.

$$\text{Cost} = (\$2500/\text{acre} * 1.0 * 1.02 * 0.82 * 1.2 - 20 \text{ MBF/acre} * \$76.50/\text{MBF}) * 2.11 \text{ Acres/mile} = \$2070/\text{Mile}$$

Step 2: From Table T-1, Excavation = 1726 CY/Mile. Base cost for excavation from Section 204 = \$1.51/CY. Percent labor = 30%. Adjustment factor for Davis-Bacon wages from Table 3 in the Engineer's Estimate section for Idaho Zone 2 = 1.02. Adjustment factor for Purchaser wage rate adjustment from the Purchaser Cost Adjustment Factor for Wage Differentials table = 0.87.

$$\text{Cost} = 1726 \text{ CY/Mile} * \$1.51/\text{CY} = \$2,606/\text{Mile} * 1.02 * 0.87 = \$2313/\text{Mile}$$

Step 3: From Table T-1, Seeding = 2.38 Acres/Mile. Unit cost from Section 625 for seeding with fertilizer, no mulch = \$500/Acre. Percent labor = 50%. Adjustment factor for Davis-Bacon wages from Table 3 in the Engineer's Estimate section for Idaho Zone 2 = 1.03. Adjustment factor for Purchaser wage rate adjustment from the Purchaser Cost Adjustment Factor for Wage Differentials table = 0.78.

$$\text{Cost} = 2.38 \text{ Acres/Mile} * \$500/\text{Acre} = \$1190 * 1.03 * 0.78 = \$956/\text{Mile}$$

Step 4: Obliteration. Use costs from Section 211. Outslope road = \$1020/Mile. Rip roadbed = \$610/Mile. Percent labor = 40%. Adjustment factor for Davis-Bacon wages from Table 3 in the Engineer's Estimate section for Idaho Zone 2 = 1.02. Adjustment factor for Purchaser wage rate adjustment from the Purchaser Cost Adjustment Factor for Wage Differentials table = 0.82.

$$\text{Cost} = \$1020/\text{Mile} + \$610/\text{Mile} = \$1630/\text{Mile} * 1.02 * 0.82 = \$1363/\text{Mile}$$

$$\text{Step 5: } (1) + (2) + (3) + (4) = \$6,702/\text{mile}$$

$$\text{Step 6: } \$6,702/\text{mile} * 1.5 \text{ miles} = \$10,053$$

Step 7: Drainage structures:

$$3 \text{ Drain Dips @ } \$110 \text{ Each} - \text{from Section 204} - 3 * \$110 = \$330$$

$$1 - 18'' * 40' \text{ CMP @ } \$28/\text{LF} - \text{from Section 602} = 40 * \$28 = \$1,120$$

$$1 - 24'' * 36' \text{ CMP @ } \$33/\text{LF} - \text{from Section 602} = 36 * \$33 = \$1,188$$

Temporary Road Cost Estimating

Total drainage structure cost = \$330 + \$1,120 + \$1,188 = \$2,638

Percent labor = 30%. Adjustment factor for Davis-Bacon wages from Table 3 in the Engineer's Estimate section for Idaho Zone 2 = 1.02. Adjustment factor for Purchaser wage rate adjustment from the Purchaser Cost Adjustment Factor for Wage Differentials table = 0.87.

Cost adjusted for Purchaser wage rates = \$2,638 x 1.02 x 0.87 = \$2,341

Step 8: (6) + (7) = \$10,053 + \$2,341 = \$12,394

Mobilization = \$12,394 x 0.07 = \$870

Total = \$13,264

Step 9: \$13,264/ 1.10 (profit) = \$12,060 (rounded)

Note: Temporary erosion control measures are not included in above example, refer to Section 157 for additional information. Also, this example did not include truck turnouts or turn-arounds or additional clearing for windrows.

TABLE T-1

Summary of quantities for a 12 foot wide road template w/o ditch, with 3/4:1 cutslopes and 1.33:1 fill slopes

No Minimum clearing width, seeding applied to ALL slopes and roadbed.

Clearing limits are 0 feet beyond top of cut, 0 feet beyond toe of fill.

Excavation is based on self-balanced sections, compaction factor of 25% was used.

Average Sideslope (%)	25 % Comp. Excavation per mile (CY)	Clearing per mile (Acre)	Seeding per mile (Acre)
10	386	1.63	1.69
20	1023	1.83	1.99
30	1726	2.11	2.38
40	2753	2.51	2.92
50	4239	3.11	3.74

COST ESTIMATE FOR TEMPORARY ROADS

Sale Name _____		Made by _____	
Unit or Road No. _____		Checked by _____	
Reference: Cost estimating procedures for temporary roads from Cost Guide - pages _____			
Average Side Slope: _____			
Length:	_____	ft. = _____	Miles
Timber Volume:	_____	MBF/Acre	
Drainage Structures:	_____	Dips	
	_____	18" CMP, _____" CMP	
(1)	Clearing and Grubbing	= _____	/Mile
(2)	Excavation	= _____	/Mile
(3)	Seeding	= _____	/Mile
(4)	Obliteration	= _____	/Mile
(5)	Total Unit Cost (1)+(2)+(3)+(4)	= _____	/Mile
(6)	Basic Cost Total (5) x Length = _____ /Mile x _____ Mile(s) = _____		
(7)	Drainage Structures		
	Drainage Cost Total	=	_____
(8)	Basic Cost (5) + Drainage Cost (6) = _____ (a)		
	Mobilization = (a) _____ x _____ % = _____ (b)		
	Subtotal = Mobilization (b) + (a) = _____ (c)		
(9)	TOTAL COST = (c) _____ / 1.10 (Profit) = _____ *		

End of Temporary Road Cost Estimating

