

Cost Estimating Guide for Road Construction

OCTOBER 2017

USDA FOREST SERVICE NORTHERN REGION ENGINEERING

2017

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PART II. DIVISION 100 - GENERAL REQUIREMENTS

GENERAL INFORMATION AND INSTRUCTIONS

Revisions and Updates.

A review of the Cost Guide is conducted bi-annually. Adjustments will be made as needed.

Policy.

This Cost Guide is based on direction provided in FSH 7709.56 – Road Preconstruction Handbook; Chapter 70 – Plans, Specifications, and Estimates.

Specifications and Section Numbers.

The Cost Guide has been written using FP-14 (Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects) and Forest Service Supplemental Specifications (FSSS) as work item descriptions. The Specifications are referred to by Section Numbers. Supplemental Specifications are referred to by FSSS. The FSSS's replace or modify the parent specification.

Costs associated with these specification are for construction and reconstruction activities and is not intended for maintenance activities. Estimator should make appropriate adjustments for maintenance activities.

Time and Equipment 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:

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

Taxes. On purchase of material.

Bonding cost. May be included in Section 151. - MOBILIZATION.

"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. 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.

Support Equipment. Fuel trucks, pickups, crew transportation, and so forth.

Permit fees.

Note: labor and equipment rates shown in this Cost Guide include applicable "payroll loading" and profit and overhead.

Rounding of Unit Costs.

Round off the unit price to the nearest significant figure. A good rule of thumb is to compare the rounding of unit costs with the significant figure of the quantity or value of the item. For example, clearing costs measured to a tenth of an acre generally should be rounded to the nearest \$10 or \$25.

Excavation costs should be rounded to the nearest \$.10 per cubic yard, and culvert costs should be rounded to the nearest \$.50/lineal foot

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 (timber sale), and so forth.

Profit and Risk Factor.

The profit and risk factor used in this Cost Guide is 6 percent. All unit prices shown in the Guide include this allowance, including the EQUIPMENT RATES tables. Payroll overhead costs of 10 percent are used in all rates in addition to the 6 percent profit and risk factor.

Time Estimates.

In accordance with Section 52.211-10 of the Federal Acquisition Regulations (FAR's), contract time for public works contracts must be calculated based on a continuous run of contract time. The contract time must include an estimate of the winter shutdown time. If the midpoint of construction is computed, it should be based on the midpoint of work or the midpoint of estimated cash flow, not the midpoint of contract time.

Public Works & Timber Sale Estimates.

All engineer's estimates for construction, with the exception of quality control and bonding, are prepared as if construction is to be accomplished by a Public Works (PW) contract. For Timber Sale (TS) estimates, the PW estimate is adjusted to reflect Purchaser Wage Rates.

Davis-Bacon Wage Decisions (Construction Wage Rates) and Service Contract Act Wage Determinations.

Use current Davis-Bacon Wage Decisions issued by the U.S. Department of Labor under Davis-Bacon and related Acts. The Wage and Hour Division of the U.S. Department of Labor determines prevailing wage rates to be paid on federally funded or federally assisted construction projects. Obtaining the wage rates from the Department of Labor is the responsibility of the Federal agency that funds or provides financial assistance to Davis-Bacon covered construction projects. Ensure that the proper Davis-Bacon wage decisions are applied to such construction contracts (29 CFR 1.5-1.6(b)).

Wage rates for a survey crew comprised of party chief, instrument person, and/or chain person are contained in the Service Contract Wage Determinations.

Davis-Bacon and Service Contract Wage Rates are found at [Davis-Bacon Wage Rate Web site](#) and [Service Contract Act Wage Rate Web site](#)

Timber Sale Purchaser Wage Rate Adjustments.

The specified road cost is the road cost estimate for a public works contract adjusted to reflect the difference between public works wage rates and local logging industry wage rates. Do not adjust the cost for items that purchasers are required to perform if both of the following conditions apply: (a) the work is likely to be subcontracted and (b) the subcontractors are likely to pay Davis Bacon wage rates.

Determine the specified road cost for a pay item by applying the Labor Percentage and Wage Ratio.

Labor Percentage. The labor percentage is that portion of each construction pay item cost attributable to labor as determined by analyzing the costs of labor, materials, and equipment for each item.

Wage Ratio. The wage ratio (100 percent labor value) is the public works wage rate divided by the local logging industry weighted average wage rate for an equivalent skill or group of skills

Further explanation and examples can be found in the ENGINEER'S ESTIMATE and TIMBER SALE PURCHASER WAGE RATE ADJUSTMENTS. Sections of this Cost Guide.

Fuel Prices.

Fuel costs include Federal and State taxes and can be quite variable over a period of time due to geopolitical conditions. Contractors may be purchasing off-highway fuel. Equipment prices in this Cost Guide may need to be adjusted by the estimator to compensate for these variations. Other equipment that uses fuel or propane such as asphalt plant dryers, generators, etc. may also cost more or 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 Cost 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.

Contractor Quality Control (QC) and Quantity Measurement.

Section 153. - CONTRACTOR QUALITY CONTROL is applicable for Quality Control for all contracts. Costs are to be included as an allowance in their associated pay items. Do not have a separate pay item for quality control. Estimating procedures and unit costs for contractor QC are outlined in Section 153. - CONTRACTOR QUALITY CONTROL of this Cost Guide. Estimator is reminded to stay current with policy regarding timber sale QC requirements.

Adjustments of Inflation and Deflation.

Until further notice, no adjustments to unit costs should be made for inflation or deflation.

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.

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 with small quantities of aggregate or asphalt materials. Mobilization of equipment may exceed the direct costs of the material itself. Small

construction projects may have a relatively high mobilization cost for transport of dozers, excavators, and other specialized equipment.

Signs.

On public works contracts the contract should require the contractor to furnish and install all signs in accordance with the project sign plan. For Timber Sales (TS) and 14i (turnback) contracts, the purchaser may be required to furnish and install (or install only) permanent warning and regulatory signs. Signs for closure devices (gates, barricades, etc.) on TS contracts (including 14i contracts) are considered as a part of the closure device and should be furnished and installed by the purchaser (or 14i contractor). This includes advance warning signs for such closures. Route markers are part of the road work and are furnished by the purchaser (mile markers are also required road work signs).

Engineering Services.

Deposits for engineering on road reconstruction may be allowed refer to TS contract provision C5.213# – DEPOSIT FOR RECONSTRUCTION ENGINEERING SERVICES and FSH 2409.18 43.43.

Post-award engineering (PAE) includes purchaser and Forest Service surveying, slopstaking, and/or designing. Specified roads with PAE need to be listed in the Timber Sale (TS) contract provision A7 (AT7) for Purchaser Engineering and A8 (AT8) for FS engineering

Salvage sale funds for engineering work may be used for salvage sales.

Change Orders & Design Changes.

The principles, costs, etc. listed in this Cost 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.

North Dakota / South Dakota / Washington.

Costs estimates for road construction in these States should be adjusted by local equipment and material costs, applicable Davis-Bacon Wage Decisions and Service Contract Act Wage Determinations. This Cost Guide is oriented to activity in Montana and Idaho. Information under 'Equipment Rates' gives information on adjusting equipment rates for North and South Dakota.

Specifications.

All cost in this guide are associated with Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects FP-14 and FSSS. Specifications may change and users of this guide should verify that the costs are associated with the correct type of work.

404 Permitting.

Federal regulations require 404 permits for all activities that will result in the discharge or placement of dredged or fill material into water bodies and wetlands. Road decommissioning, the replacement of a culvert or bank stabilization (i.e. rip rap) that is identical in size and extent of the existing/failed structure, and road construction or stored road reconstruction for a timber sale are the only forestry activities that are exempt from needing a 404 permit. The US Army Corps of Engineers provides 404 permits, and state agencies provide a corresponding 401 water quality certification. Fees are typically not required from the federal agencies. There is a 45 day review period.

Storm Water Permitting.

EPA regulations require NPDES permits for road construction activity with more than 1 acre or rock pits and quarries. Timber sale road construction is exempt from needing NPDES permits, but rock pits or quarries for timber sale roads must be permitted.

Permit regulating agency by State:

Idaho: EPA

Montana: Department of Environmental Quality (DEQ) Water Protection Bureau

South Dakota: Department of Environmental and Natural Resources

North Dakota: Division of Water Supply and Pollution Control.

Permits must be obtained by the contractor before construction begins. Fees may apply. Consult permit regulating agency for cost estimating permit fees.

Montana Stream Protection Act (SPA 124) and 318 Authorization Permits.

SPA 124 permits issued by the Montana Department of Fish, Wildlife and Parks are required for any project including the construction of new facilities or the modification, operation, and maintenance of an existing facility that may affect the natural existing shape and form of any stream or its banks or tributaries. Expect a 30 to 90 day review period. There is no application fee.

Any activity in any state water that will cause unavoidable short term violations of water quality standards will require a 318 Authorization Permit. The 318 permits are administered by the Montana Department of Environmental Quality with an application fee may apply. There is usually 30 to 60 day review period.

Internet.

The cost guide can be found on the Forest Service Northern Region internet by navigating to [Working Together, Contracting, Cost Estimating Guide for Road Construct](#). If you do not have access to the internet, you can request a copy from U. S. Forest Service, Northern Region Engineering.

Summary.

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

ENGINEER'S ESTIMATE

The preliminary estimated unit costs using the Public Works Davis-Bacon Wage Decisions rates may need to be adjusted. Determine the county and/or zone and adjust the unit costs per instructions of this section.

Determination of Wage Rate Zone

IDAHO

Kootenai County:

Zones are not applicable for the labor classifications in WHD General Decision Number ID20160096 for Kootenai County, therefore only one set of labor rates is given.

Nez Perce County:

Zone 1: Within 45 radius miles from the main Post Offices of Spokane and Lewiston

Zone 2: Outside 45 radius miles from the main Post Offices of Spokane and Lewiston

Rest of Idaho:

The portion of Region 1 that lies in the following Idaho Counties: Benewah, Bonner, Boundary, Clearwater, Idaho, Latah, Lewis, Shoshone. Zones are not applicable for the classifications for highway construction used in this guide.

MONTANA

In Montana there are three (3) wage rate zones based on the shortest practical route over maintained roads from the center of the project to the nearest County Court House located in the following listed towns:

Billings, Butte, Helena, Missoula, Bozeman, Great Falls, Kalispell

The zones are defined as:

Zone 1: 0-25 miles

Zone 2: 25-50 miles

Zone 3: over 50 miles

NORTH DAKOTA / SOUTH DAKOTA / WASHINGTON

Adjust the preliminary unit costs by applicable Construction Wage Rates (Davis-Bacon) Wage differential. Contact the Regional Office for necessary data.

Adjustment Factors for Unit Costs

Adjust the preliminary estimated unit prices by multiplying them by the appropriate factor in the following table. The factors are based on the appropriate Construction Wage Rates (Davis-Bacon) with fringes and overhead loading for a mixed work force of equipment operators, laborers, and truck drivers.

Table 1. Adjustment Factor for Public Works Davis-Bacon Zones

LABOR %	Kootenai County Idaho	Nez Perce County Idaho ZONE 1	Nez Perce County Idaho ZONE 2	Rest of Idaho	Montana ZONE 1	Montana ZONE 2	Montana ZONE 3
5	1.00	1.00	1.00	1.00	1.00	1.00	1.00
10	1.01	1.00	1.00	1.00	0.99	1.00	1.00
15	1.01	1.01	1.01	1.00	0.99	1.00	1.00
20	1.01	1.01	1.01	1.00	0.98	1.00	1.00
25	1.02	1.01	1.01	1.00	0.98	1.00	1.00
30	1.02	1.01	1.01	1.00	0.98	1.00	1.00
35	1.02	1.01	1.02	1.00	0.97	1.00	1.00
40	1.02	1.01	1.02	1.00	0.97	0.99	1.00
45	1.03	1.02	1.02	1.00	0.96	0.99	1.00
50	1.03	1.02	1.02	1.00	0.96	0.99	1.00
55	1.03	1.02	1.02	1.00	0.95	0.99	1.00
60	1.04	1.02	1.03	1.00	0.95	0.99	1.00
65	1.04	1.02	1.03	1.00	0.95	0.99	1.00
70	1.04	1.02	1.03	1.00	0.94	0.99	1.00
75	1.05	1.03	1.03	1.00	0.94	0.99	1.00
80	1.05	1.03	1.04	1.00	0.93	0.99	1.00
85	1.05	1.03	1.04	1.00	0.93	0.99	1.00
90	1.05	1.03	1.04	1.00	0.93	0.99	1.00
95	1.06	1.03	1.04	1.00	0.92	0.99	1.00
100	1.06	1.03	1.04	1.00	0.92	0.99	1.00

Examples of Applying Adjustment Factors for the Unit Costs

Example No. 1:

Idaho, Kootenai County
 18" culvert (new construction), Percent labor = 35%
 Cost Guide unit cost = \$22.00/lf
 Kootenai County unit cost = \$22.00 x 1.02 = \$22.44/lf

Example No. 2:

Rest of Idaho
 18" culvert, Percent Labor = 35%
 Cost Guide unit cost = \$22.00/lf
 Rest of Idaho unit cost = \$22.00 x 1.00 = \$22.00/lf

Example No. 3:

Montana, Zone 1
 18" culvert, Percent Labor = 35%
 Cost Guide unit cost = \$22.00/lf
 Zone 1 unit cost = \$22.00 x 0.97 = \$21.34/lf

TIMBER SALE PURCHASER WAGE RATE ADJUSTMENTS.

The specified road cost is the road cost estimate for a public works contract adjusted to reflect the difference between public works wage rates and local logging industry wage rates.

Do not adjust the cost for items that purchasers are required to perform if both of the following conditions apply: (a) the work is likely to be subcontracted and (b) the subcontractors are likely to pay Davis Bacon wage rates.

Determine the specified road cost for a pay item by applying the Labor Percentage and Wage Ratio.

Labor Percentage. The labor percentage is that portion of each construction pay item cost attributable to labor as determined by analyzing the costs of labor, materials, and equipment for each item.

Wage Ratio. The wage ratio (100 percent labor value) is the public works wage rate divided by the local logging industry weighted average wage rate for an equivalent skill or group of skills

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

- Determine the Construction Wage Rate area and/or zone. Refer to the ENGINEER'S ESTIMATE Section of this Cost Guide.
- Determine labor percentage for applicable item under each section of this Cost Guide or from Table 2. Labor Percentages.
- Select the appropriate labor factor from Table 1. Adjustment Factor for Public Works Davis-Bacon Zones
- Determine Specified Road Cost for applicable item **by dividing** the Engineers Estimate by the labor factor determined from Table 3. Adjustment Factor for Construction Wage Rate Differentials.

Example:

Excavation cost = \$2.85/CY

Project Location: Kootenai County of Idaho

Excavation labor percentage from Table 2. Labor Percentages = 25 percent

Labor Factor from Table 1. Adjustment Factor for Public Works Davis-Bacon Zones= 1.02

Labor Factor Wage Adjustment from Table 3. Adjustment Factor for Construction Wage Rate Differentials = 1.09

Engineers (Public Works (14i- turnback)) Estimate = $\$2.85 \times 1.02 = \2.91

Specified Road Cost = $\$2.91/1.09 = 2.67/\text{CY}$

The following labor percentage ranges 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 2. Labor Percentages

Work Item	Labor % Range	Low Percent Factors	High Percent Factors
Clearing & Grubbing	20-55	Small or scattered timber, light ground cover gentle terrain, scattering	Large timber, "doghair", heavy ground cover, rugged terrain, piling & burning
Excavation	20-45	Gentle terrain, good soils, easy construction, wide tolerance, sidecast type construction	Rugged terrain, poor soils and rock, difficult construction, rip/ blasting, close tolerances, end-haul
Base and Surfacing	30-50	Crushed pit rock, wide gradation tolerance	Crushed quarry rock, close gradation tolerance
Asphalt	20-40	Large project, road mix, wide tolerance, surface treatments	Small project, plant mix, close tolerance, labor intensive
Mobilization	20-40	Minimum labor required on project preparation	Project preparation is very labor intensive
Culverts	30-60	Flat slopes, soil with little rock, minimal labor requirements, small dia, dry	Steep slopes, soil with large amount of rock, labor intensive, large dia, wet
Stabilization	35-70	Hydromulch, flatter slopes, large projects	Hand placed mulch, multiple processes, steeper slopes, small projects

Refer to individual Sections of this Cost Guide for other labor percentages.

Table 3. Adjustment Factor for Construction Wage Rate Differentials

LABOR %	Kootenai County Idaho	Nez Perce County Idaho ZONE 1	Nez Perce County Idaho ZONE 2	Rest of Idaho	Montana ZONE 1	Montana ZONE 2	Montana ZONE 3
5	1.02	1.02	1.02	1.01	1.02	1.02	1.02
10	1.03	1.03	1.03	1.03	1.03	1.04	1.04
15	1.05	1.05	1.05	1.04	1.05	1.06	1.06
20	1.07	1.07	1.07	1.06	1.07	1.08	1.08
25	1.09	1.08	1.08	1.08	1.08	1.10	1.10
30	1.11	1.10	1.10	1.09	1.10	1.12	1.12
35	1.13	1.12	1.12	1.11	1.12	1.14	1.15
40	1.15	1.14	1.14	1.13	1.14	1.17	1.17
45	1.17	1.16	1.16	1.15	1.16	1.19	1.20
50	1.19	1.18	1.19	1.16	1.18	1.22	1.22
55	1.22	1.20	1.21	1.18	1.20	1.24	1.25
60	1.24	1.23	1.23	1.20	1.22	1.27	1.28
65	1.27	1.25	1.26	1.23	1.25	1.30	1.31
70	1.29	1.27	1.28	1.25	1.27	1.33	1.34
75	1.32	1.30	1.31	1.27	1.30	1.36	1.37
80	1.35	1.33	1.33	1.29	1.32	1.40	1.41
85	1.38	1.35	1.36	1.32	1.35	1.43	1.45
90	1.41	1.38	1.39	1.34	1.38	1.47	1.49
95	1.44	1.41	1.42	1.37	1.41	1.51	1.53
100	1.48	1.44	1.46	1.39	1.44	1.55	1.57

TIME ESTIMATES & CALCULATION OF MIDPOINT OF CONSTRUCTION

Even though there is no adjustment factor for inflation in this Cost Guide, care must be exercised when determining time estimates. The final time estimate should not be made until all contract clauses/provisions 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 shall 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. Time estimates in excess of two full construction seasons shall be justified, documented, and approved by the Forest Engineer.

The midpoint of construction for estimating purposes is the cost weighted average of incremental construction periods or construction items. Midpoint may be determined by analyzing the project as a whole or by analyzing individual construction items or groups of related construction items.

Due to the requirements of the Federal Acquisition Regulations (FAR's), it is essential that the midpoint be computed based on the midpoint of work or estimated cash flow, not the midpoint of contract time. FAR 52.211-10 requires that contract time be established to include estimated winter shutdowns. Contract time will continue to count through the winter season.

The remainder of this section contains two examples of determining the midpoint of construction followed by two forms. The first form may be used in calculating the midpoint of construction, and the second for use in determining the number of contract days. Note: These are examples, modify using the correct dates for your project.

Example of: Analyzing Incremental Construction Periods

Advertise	May 1, 2018	Work Season	May 15 - Nov 15
Open Bids	June 2, 2018	Total Work Days	200
Contract Award	June 15, 2018	Completion Date	July 15, 2019
Start Work	July 1, 2018	Project Cost	\$300,000

	Date	Calendar Day	Project Day
Start Work 2018 Season:	Jul 1	182	1
Suspend Work 2018 Season by:	Nov 16	320	138
Resume Work 2019 Season:	May 15	135	318
Complete Work 2019 Season before:	Jul 16	197	381

2018 Season	= 138 - 1	= 137 Work Days
Shutdown	= 318 - 138	= 180 Days
2019 Season	= 381 - 318	= 63 Work Days

Total Work Days = 2018 Season (137 days) + 2019 Season (63 days)	= 200 Days
Contract Days = Work Days + Winter Shutdown = 200 + 180	= 380 Days

Incremental Construction Periods:

2018 Construction Increment: 2018 Work Days / Total Work Days = 137/200 = 0.685

2018 Value = Project Cost x 2018 Increment = \$300,000 x 0.685 = \$205,500

2019 Construction Increment: 2019 Work Days / Total Work Days = 63/200 = 0.315

2019 Value = Project Cost x 2019 Increment = \$300,000 x 0.315 = \$94,500

Midpoint of Construction:

2018 Midpoint: 2018 Work Days / 2 = 137 / 2 = 68.5 Project Days

2019 Midpoint: 2018 Work Days + Winter Shutdown + 2019 Work Days/2 =
138 + 180 + 63/2 = 349.5 Days

Weighted Midpoint = [(2018 Value x 2019 Midpoint) + (2019 Value x 2018 Midpoint)] /
Project Cost
= [(205,500 x 68.5) + (94,500 x 349.5)] / 300,000 = 157 Days

Midpoint of Construction = 157 Project Days = December 4, 2018

Example of Analyzing Construction Items

(Same project schedule as used for Example of: Analyzing Incremental Construction Periods):

Item	←Start Work→			←Completed by→			Midpoint	Cost
	Date	Calender Day	Project Day	Date	Calender Day	Project Day		
Clr&Grub	7/01/2018	182	1	10/01/2018	274	93	46	\$75,000
Exc &CMPs	8/01/2018	213	32	6/15/2019	166	350		\$125,000
Season 1	8/01/2018	213	32	11/16/2018	320	139	85.5	\$96,900
Season 2	5/15/2019	135	319	6/15/2019	166	350	334.5	\$28,100
Aggr&Surf	5/15/2019	135	319	7/01/2019	182	366	342.5	\$90,000
Seed&Mulch	7/01/2019	182	366	7/16/2019	197	381	373.5	\$10,000

Clearing Midpoint: Clearing Work Days / 2 =(93-1) /2 = 46 Project Days

Excavation & Culverts Midpoint: This item falls during portions of two seasons. There are 107 construction days available in 2018 and 31 days available in 2019 for a total of 138 days.

Value of Work in 2018	107 days / 138 days x \$125,000	= \$96,900
Value of Work in 2019	31 days / 138 days x \$125,000	= \$28,100
Midpoint 2018	32 + (139 - 32) / 2	= Proj Day 85.5
Midpoint 2019	319 + (350 - 319) / 2	= Proj Day 334.5

Excavation & Culvert Weighted Midpoint = [(96,900 x 85.5) + (28,100 x 334.5)] / 125,000 = 141 Days

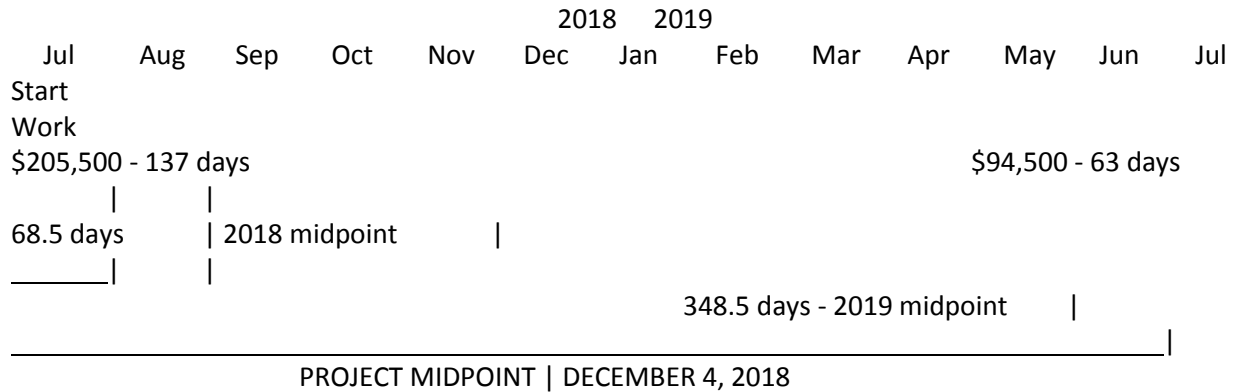
Aggregate Surfacing Midpoint = Item starting day + item days/2 = 319 + (366 - 319)/2 = 342.5 Days

Seed & Mulch Midpoint = Item starting day + item days/2 = 366 + (381 - 366) / 2 = 373.5 Days

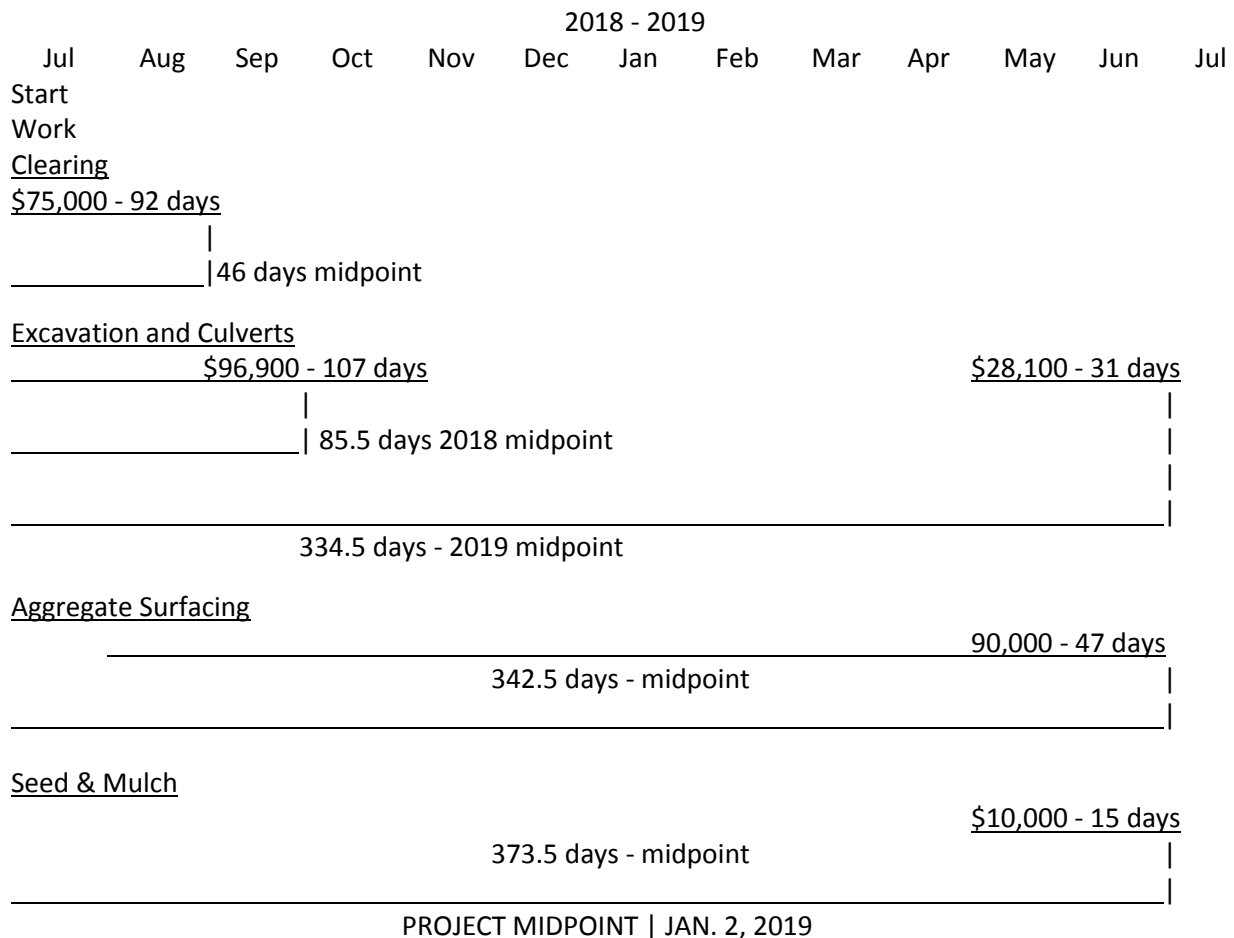
Weighted Midpoint = [(46 x 75,000) + (85.5 x 96,900) + (334.5 x 28,100) + (342.5 x 90,000) + (373.5 x 10,000)] / 300,000 = 186 Days

Midpoint of Construction = 186 Project Days or January 2, 2019

Example 1. Graphical Display of Midpoint Calculations



Example 2. Graphical Display of Midpoint Calculations



Worksheet for Incremental Construction Periods

		DATE	DAY NUMBER
START WORK SEASON 1		_____	[A]_____
STOP WORK SEASON 1		_____	[B]_____
TOTAL DAYS SEASON 1	= [B] - [A]	= [C]_____ DAYS	
START WORK SEASON 2		= _____	[D]_____
STOP WORK SEASON 2		= _____	[E]_____
TOTAL DAYS SEASON 2	= [E] - [D]	= [F]_____ DAYS	
TOTAL CONTRACT DAYS	= [C] + [F]	= [G]_____ DAYS	
TOTAL DAYS [A] TO [D]	= (365 - [A]) + [D]	= [H]_____ DAYS	
VALUE OF WORK IN SEASON 1	= [C] / [G]	= [J]_____	
MIDPOINT OF SEASON 1	= [C] / 2	= [K]_____ DAYS	
VALUE OF WORK IN SEASON 2	= 1 - [J]	= [L]_____	
MIDPOINT OF SEASON 2	= [H] + [F] / 2	= [M]_____ DAYS	
WEIGHTED VALUE MIDPOINT	= [J] X [K] + [L] X [M]	= [N]_____ DAYS	
MIDPOINT OF CONSTRUCTION	= ([A] + [N]) - 365	= [P]_____	
MIDPOINT	= JAN. 1 + [P] = _____		

Time Estimating and Scheduling Worksheet

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

	Timber Sale (T.S.) Advertisement Date	_____
1.	Sale Advertising Period	<u>30 Days</u>
	Timber Sale Bid Opening Date	_____
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. This is limited to 120 days maximum without approval of additional time of Regional Forester prior to T.S. Advertisement date. Fourth quarter sales may go over this limit due to winter conditions.	<u>80 Days*</u>
	Public Works Construction Award Date	_____
3.	Additional time needed between P.W. contract award date and date construction could start.	<u>10 Days</u>
	Public Works Construction Start Date	_____
4.	Total calendar days elapsed time allowed for completion of road construction Public Works contract.	<u>Days</u>
	Computed Construction Completion Date	_____
5.	Additional time for expected excusable delays for P.W. contracts. This time will <u>only</u> be added to determine the road completion date in a Timber Sale (C5.101) not to determine contract time for a Public Works contract.	<u>Days</u>
	Final Completion Date	_____
	Planned Timber Sale Termination Date	_____

* The following time requirements may vary by local policy, 120 days is the maximum time allowed without approval of the Regional Forester. Be aware that 4th quarter sales will exceed 120 days.

10 days to submit road package to Acquisition Management.

10 days to prepare road contract and send notice to Fedbizopps.gov

15 days to public prior to solicitation.

30 days advertising period.

15 days to award contract after bid opening; consider additional time if access to project is not available due to inclement weather.

80 days Total

PART III. DIVISION 150 PROJECT REQUIREMENTS

SECTION 151. - MOBILIZATION

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 all permits (such as storm water permits) prior to beginning work at the project site.

The average project in the database from which the information for this section was derived has two construction seasons; however, many are built in one season.

Use 7.0 percent for *contracts between \$100,000 and \$500,000* in Idaho and Montana and round to *two or three significant figures* (i.e. if calculation is \$8,234.56, round off to \$8,200 or \$8,250). Allowances for moving in and out of specialized equipment (rock crusher, paving equipment, etc.), may be made under Mobilization, included in their respective pay item, or proportioned under both. Note that under FP14 Section 151. - MOBILIZATION, the portion of mobilization over 10% of the original contract amount (Engineer's Estimate) can't be paid until after final acceptance. See Example 2 in this section for an illustration.

For *contracts under \$100,000*, and for more complex projects (aggregate, paving, etc.) the actual costs should be estimated based upon moving normal components of machinery, personnel, etc., to/from the project, and the number of seasons for the operation. For actual costs use \$6.00 a loaded mile per load. *Round off* calculated cost to two or three significant figures (see note above).

For *projects over \$500,000* in Idaho and Montana, use 6.0 percent with additional allowances for specialized equipment if applicable. *Round off* calculated cost to two or three significant figures (see note above).

Example 1:

Description	Cost
Total of all pay items <i>without</i> Section 151	= \$145,000
Cost (151) \$145,000 x 0.07	= \$10,150
Total Engineer's Estimate \$145,000 + 10,150	= \$155,150

Example 2:

Description	Cost
Total of all pay items <i>without</i> Section 151	= \$110,000
Rock Crusher required:	
Cost (Section 151) \$110,000 x .07	= \$7,700
Crusher Move-in/Move-out (Section 301)	= \$9,000
Total Cost Section 151	\$16,700
Total Engineer's Estimate \$110,000 + 16,700	= \$126,700

The mobilization of the rock crusher may be placed under Section 151. - MOBILIZATION, Section 301. – UNTREATED AGGREGATE COURSES, or portioned under both. Under this example, place \$12,700 (rounded) under Section 151. - MOBILIZATION and \$4,000 under Section 301. – UNTREATED AGGREGATE COURSES so the \$4,000 can be paid before final acceptance (FP14, Section 151).

Mobilization of specific items may be placed under their specific section. In Example 2 the allowance for the rock crusher may be placed under Section 301. – UNTREATED AGGREGATE COURSES.

SECTION 152. - CONSTRUCTION SURVEY AND STAKING

(Contract Item)

The estimator is reminded of the Regional policy, per FSM 7720 R1 Supplement, that engineers/surveyors involved in P-line surveys and design of Forest development roads or those under permit be licensed. State requirements require that they be licensed or authorized to practice in the State where the project is located. Roads on timber sales with purchaser surveying, slopestaking, and/or design requirements need to be listed in provision A7 (AT7).

Road Location

The most recent costs for road location range from \$1,250-\$2,550/mile. This should rarely be used.

Preliminary Survey

Costs for negotiated A/E contracts range from \$3,000/mile for surveys of low-standard new roads (raw land) in open, easily accessible terrain, to \$10,000/mile for surveys of existing roads proposed for high-standard reconstruction. 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.

Recently, the average cost of all P-Line A/E surveys (new and reconstruction) is about \$8,000 - \$10,000/mile. Detailed surveys of existing roads generally run higher than new construction due to the presence of cut/fill slopes, culverts, and other features. These costs includes travel which is about 35 percent of the total. If data entry of survey notes and plotting of profile, traverse, and X-sections are desired, add \$525/mile. Reestablishment of old P-Line can be estimated to cost about \$1,000/mile.

Most contracts had some Medium Accuracy Standard survey, but were predominately Low Accuracy Standard survey. See FSH 7709.56 39 Exhibit 01.

Survey costs for A/E negotiated survey and design contracts should be estimated using the above costs for P-Line surveys as a base. 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.

Information received from A/E contractors indicates the following average rates charged for fieldwork under negotiated contracts:

Table 4. Wages and Per Diem for Surveying

Description	Wages and Per Diem
Two-person field party	\$138/Hour
Three-person field party	\$190/Hour
Registered Land Surveyor	\$103/Hour
Per diem	Use current federal per diem rate
Transportation	Use current federal standard mileage rate
Motel, camp expenses	Use current federal CONUS rates

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

Brushing

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

Table 5. Survey Brushing - Density of Stems

Extra heavy	0.35 miles/day
Heavy	0.5 miles/day

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 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.

Table 6. Production Rate (Miles/Day) for Traverse Based on Survey Accuracy as Defined in FSH 7709.56_39 Exhibit 01

PI's per mile	High	Medium	Low
60 to 70	n/a	0.5 miles/day	0.6 miles/day
50 to 60	n/a	0.6 miles/day	0.7 miles/day
40 to 50	0.3 miles/day	0.7 miles/day	0.8 miles/day
30 to 40	0.5 miles/day	0.8 miles/day	0.9 miles/day
20 to 30	0.6 miles/day	0.9 miles/day	1.0 miles/day
10 to 20	0.9 miles/day	1.0 miles/day	1.1 miles/day
5 to 10	1.0 miles/day	n/a	n/a

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.

Table 7. Production Rate (Miles/Day) for Levels Based on Survey Accuracy as Defined in FSH 7709.56_39 Exhibit 01

Level	Production Rate
High	0.5 miles/day
Medium	0.7 miles/day
Low	1.0 miles/day

Cross Sections:

Three-person crew. Cross sections are generally constant in production between 0.4 miles to 0.7 miles 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.

Table 8. Production Rate (Miles/Day) for Cross Sections Based on Percent Slope

Percent Cross Section	Production Rate
50 percent +	0.4 miles/day
30 to 50 percent	0.6 miles/day
0 to 30 percent	0.7 miles/day

Supervision

Allow 1 day per week of survey crew time for supervisory engineer @ \$800 per day.

Move-in/Move-out

Allow for move-in/move-out costs, supplies, transportation, etc.

Office Work

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 \$114 per hour.

Materials Investigation and Testing

Refer to Section 153. - CONTRACTOR QUALITY CONTROL or Section 154. - CONTRACTOR SAMPLING AND TESTING for unit costs.

Road Design

(Includes classification, plan & profile, cross sections, and plan-in-hand reviews)

Ranges from \$2,650 to 4,250 per mile for new construction.

Corner Search, Monument, and Boundary Marking & Posting

Corner search costs are highly variable, depending on terrain, access, and difficulty of finding evidence. Monument costs can be estimated at \$160 to \$185 per corner. Marking and posting boundary lines can be estimated at \$5,300 to \$8,000 per mile. Additional allowance should be made for areas in rugged terrain, poor access, and heavy ground cover.

Other Preliminary Surveys

Surveys with the total station equipment such as bridge sites or campgrounds, estimate using a two or three person survey crew. In addition, allow for travel expenses (mileage, camp, motel, etc.) and the downloading and plotting of survey data at the office.

Road Construction Survey and Staking:

Average base cost (\$/mile) - Three person field crew is \$2,650 - \$3,700

Add \$100.00 per culvert for culvert staking on reconstruction roads.

Average base prices should be multiplied by the following factors to determine cost estimate. (Average project -- assume camp is within five miles of project and access is at the beginning of each job and each job is two miles in length.)

Table 9. Adjustment Factors by Type of Survey, Survey Accuracy and Construction Tolerance as Defined In FSH 7709.56_39 Exhibit 01

Type of Survey	High - A	High - B	Medium - C	Medium - D	Low - E	Low - Other
Establishing Centerline	1.2	1.1	1.0	n/a	n/a	n/a
Slope Staking	1.2	1.2	1.15	n/a	n/a	n/a
Finish Staking, Subgrade	1.1	1.05	1.0	n/a	n/a	n/a
Finish Staking, Base Course	1.2	1.2	1.1	n/a	n/a	n/a
Staking Major Structure(s)	1.0	1.0	1.0	n/a	n/a	n/a
Construction Staking	n/a	n/a	n/a	1.0	0.85	n/a
Establishing Clearing Limits	n/a	n/a	n/a	n/a	n/a	0.3
Establishing Slope Stakes	n/a	n/a	n/a	n/a	0.6-0.8	n/a
Construction Survey & Staking	n/a	n/a	n/a	n/a	n/a	0.4
Finish Staking	1.1	1.05	1.0	n/a	n/a	n/a

Table 10. Additional Survey Adjustment Factors to Consider

Type	Description	Factor
Method I	Computed	multiply by 1.5
Method II	Slope staking one side	1.0
Method II	Slope staking both sides	multiply by 1.15 to 1.3
Side Slopes	0-30%	multiply by 0.9
Side Slopes	50% and over	multiply by 1.1
Brush Density	Light	multiply by 0.9
Brush Density	Heavy brush	multiply by 1.2

SECTION 153. - CONTRACTOR QUALITY CONTROL

These costs are to be included in their respective pay item.

DO NOT HAVE QUALITY CONTROL AS A SEPARATE PAY ITEM!

SECTION 154. - CONTRACTOR SAMPLING AND TESTING

(Contract Item)

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

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 FP-14 Specification 153 as modified by FSSS 153 or FP-14 Specification 154).

- Approximately \$30/day while the above-noted work is in progress.

- Approximately \$20/day while the above-noted work is not in progress but work requiring contractor quantity measurements is in progress.

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

- Approximately \$20/day while work requiring contractor quantity measurements is in progress.

The following table, PROJECT FIELD SAMPLING AND TESTING, gives estimated costs for contractor sampling and testing.

Overall costs for contractor sampling and testing, not including costs for individual tests, should range from \$525/week for relatively simple projects to \$2,100/week for more complex projects if only one technician is required. Add up to \$1,400/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 154. - CONTRACTOR SAMPLING AND TESTING 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 quality control (no specific field tests), all costs are incidental to other items and should not exceed \$55-\$110/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.

Table 11. Project Field Sampling and Testing - Labor Cost

Description	Estimated Cost
Project Manager (Senior)	\$145/hour (Assume 1 visit per month or \$335/week)
Civil Engineer	\$125/hour
Geotechnical Engineer	\$125/hour
Materials Technician (Journey)	\$82/hour
Support Staff	\$70/hour
Earth Dams Engineer (Geotechnical)	\$140/hour
Geologist	\$125/hour
Engineering Geologist	\$170/hour
CADD Technician	\$87/hour
Eng. Technician	\$80/hour (Required daily for extensive sampling and testing, \$480/day or \$2400/week for other projects, 3 days/week or \$1440/week)
Mileage	Use current federal standard mileage rate
Per diem	Use current federal per diem rate
Mobile lab	\$500/wk.+ mobilization

The following test method costs are based on the Regional Geotechnical contract.

Table 12. Project Field Sampling and Testing – Test Method Cost

AASHTO Item Or Other	Description	Unit	Estimated Cost
T22	Concrete Compression Test per cylinder	EA	\$25
T22, T23	Concrete Field test (including air, slump, cast and test 3 cylinders)	EA	\$200 plus travel time
T89, T90	Atterberg Limits	EA	\$95
T27, T11	Gradation/Sieve Analysis	EA	\$120
T265, T255	Moisure Content	EA	\$10.50
T84, T85	Specific Gravity/Absorption	EA	\$95
T99, T180	Moisure Density Test	EA	\$160
T96	Los Angeles Abrasion Tests	EA	\$190
T210	Durability	EA	\$140
T176	Sand Equivalent	EA	\$115
T104	Sodium Sulfate	EA	\$410
Idaho DOT Test T-72	Idaho Cleaniness	EA	\$95
T2	Sampling of Aggregates	Hour	\$80
T245 (ASTM D 1559)	Marhall Mix	EA	\$2100
T246, T247 (ASTM D 1560, 1561)	Hveems Mix	EA	\$3675
R-35 T312	Superpave Mix	EA	\$4725
T209	Rice/Theoretical Specific Gravities	EA	\$100
PCA Procedures	Soil & Aggregate Stabilization	Hour	\$90
Asphalt Institute MS-13 Appendix C	Chip Seals	Hour	\$160
ASTM D2950	Density of Bituminous Concrete in Place by Nuclear Method	Hour	\$85
Fed Hwys FLH T508	Flakiness Index	EA	\$165
T30	Mechanical Analysis of Extracted Aggregate	EA	\$120
R66	Sampling Bituminous Material	Hour	\$90
T168	Sampling Bituminous Paving Mixtures	Hour	\$90
T164, T308	Extraction of Bitumen from Bituminous Paving Mixture	EA	\$315
T165	Effect of Water on Cohesion of Compacted Bituminous Mixtures	EA	\$735
T167	Compressive Strength of Bituminous Mixtures	EA	\$735
T166, T275	Bulk Specific Gravity of Compacted Bituminous Mixture	EA	\$60
T209	Maximum Specific Gravity of Bituminous Paving Mixtures	EA	\$100
T172	Bituminous Mixing Plant Inspection	Hour	\$90
ASTM D5821	Fractured Faces	EA	\$85
T88	Particle Size Analysis (minus #200 on sieve)	EA	\$70

AASHTO Item Or Other	Description	Unit	Estimated Cost
T112	Clay Lumps and Friable Particles	EA	\$95
ASTM D4791	Flat and Elongated Particles	EA	\$105
T193	California Bearing Ratio	EA	\$525
ASTM D2166	Unconfined Compression	EA	\$105
T236	Direct Shear Test	EA	\$505
ASTM D4767	Triaxial Shear Tests	EA	\$1575
ASTM2435	Consolidation Test	EA	\$265
T215	Permiability Tests	EA	\$445
n/a	Pavement Investigation Drill + Crew, Core /Auger Drill, Sample to a maximum depth of 6'	Hour	\$210
n/a	Geotechnical Investigation Drill + Crew, Core /Auger Drill and Sample/SPT test to a maximum depth of 50'	Hour	\$210
n/a	Mobilization of Drill Crew with Equipment	Mile	\$1.31
n/a	Geotechnical Investigation Backhoe/Excavator + Operator Test Pit and Samples to a maximum depth of 25'	Hour	\$200
n/a	Mobilization of Backhoe/Excavator with Operator	Mile	\$4.20

SECTION 156. - PUBLIC TRAFFIC

Traffic Control

The cost of opening a road under reconstruction to traffic several times during the day can add as much as 30 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.

Table 13. Adjustment Factor for Traffic Control

Description	Factor
Open to traffic twice during work shift	Add 30 percent of Base Cost for Common Excavation plus added adjustment factors (Section 204. - EXCAVATION AND EMBANKMENT)

Description	Factor
Open to traffic once during work shift	Add 15percent of Base Cost for Common Excavation plus added adjustment factors (Section 204. - EXCAVATION AND EMBANKMENT)
Open to traffic at end of work shift	Add 5 percent of Base Cost for Common Excavation plus added adjustment factors (Section 204. - EXCAVATION AND EMBANKMENT)

Construction Induced Maintenance (CIM).

Payment for construction induced maintenance can be made in several ways, depending on the situation. CIM shall be included in and made a requirement of the contract, public works or timber sale. *Do not make CIM a separate pay item.*

- When CIM is required to support a specific construction activity, payment and the cost estimate should be included in that item. Hauling of aggregate or borrow are examples of this.
- If the CIM is required to support general construction access and traffic, CIM can be included in mobilization.
- 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. - PUBLIC TRAFFIC are required to define the work and indicate how payment will be included in the contract. Be sure to follow directions regarding commensurate shares when estimating and specifying this work.

SECTION 157. - SOIL EROSION AND SEDIMENT 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., water bars 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 pit run borrow source, an alternate source which may be more costly is necessary.

Costs may be estimated directly under Section 157. - SOIL EROSION AND SEDIMENT CONTROL and shown on the Schedule of Items or may be an indirect cost 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 included in other items or paid for under Section 157. - SOIL EROSION AND SEDIMENT CONTROL

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. - SOIL EROSION AND SEDIMENT CONTROL.

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. - SOIL EROSION AND SEDIMENT CONTROL. This cost should not be considered under Section 625. - TURF ESTABLISHMENT.

Windrow Slash Disposal

If the primary purpose of the windrow is slash disposal, this work should be priced under Section 201. - CLEARING AND GRUBBING. When all or part of this cost is exclusively for erosion control, it should be shown as a cost under Section 157. - SOIL EROSION AND SEDIMENT CONTROL.

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.

Cost of preparing storm water permit applications or turbidity permits for EPA or State agencies should be included in Section 151. - MOBILIZATION.

Table 14. Costs and Percent Labor Associated With Soil Erosion and Water Pollution Control

Parent Specification	Description of Work	Pay Unit	Estimated Cost	Percent Labor
157	<u>Temp Seeding & Fertilizing</u> : Seed @ 25 lbs./acre, seed & fertilizer in one application. Fertilizer @ 200 lbs./acre . Material Price/Acre = \$180-\$340	Acre	\$250-\$550	20-70%
157	<u>Dry Mulching (Straw or Hay)</u> : Seed @ 25 lbs./acre. Fertilizer @ 200 lbs./acre. Straw or Hay @ 2 tons/acre = 80 bales/acre	Acre	\$600-\$1000	20-70%
157	<u>Hydro mulching</u> (Wood Cellulose): Seed @ 25 lbs./acre. Fertilizer @ 200 lbs./acre. J-TACK H-S @ 120-160 lbs./acre. Wood Cellulose Fiber @ 150-300 lbs./acre Hay or Straw @ 2 tons/acre. Water as Necessary	Acre	\$3500-\$5500	20-50%
157	<u>Netting</u> : Price using specific Material / Labor, etc. Material Price/SY = \$2- \$5	S.Y.	\$7-\$9	40-90%
157	<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. Material Price/bale = \$4-\$7	Each	\$15-\$30	60-90%
157	<u>Gravel Blanket</u> : Sheathing	C.Y.	Estimate by Materials, Time & Equipment	

Parent Specification	Description of Work	Pay Unit	Estimated Cost	Percent Labor
157	<u>Silt Fence</u> : Used 8' long Steel Posts @ 6' centers with 36" Welded Wire, Geotextile Fabric. Material Price/LF = \$3	L.F.	\$4-\$10	30-60%
157 or 201	<u>Brush Barrier</u> : Method 12 In R-1 Cost Guide This work consists of placing brush on the fill slope to reduce sediment erosion.	L.F.	Estimate using Cost Guide, Section 201. - CLEARING AND GRUBBING	
157 or 201	<u>Sediment Basin</u> : Scoop native material from stream bed below live water prior to installation of new CMP. Place brush and straw bales on down-stream end of sediment basin. Can also place bales w/brush to impede sediment flow. Use Time & Equip, estimate 15-30 min. w/excavator	Each	Estimate by Materials, Time & Equipment	
157 or 201	<u>Berm</u> : Earth Berm	L.F.	Estimate by Materials, Time & Equipment	30%
157 or 201	<u>Dam</u>	Each	Estimate by Materials, Time & Equipment	
157 or 201	<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 water bars, w/o removal. Temp water bars will not provide adequate protection when installed with soil in overly saturated state. Not intended for permanent use. Small Excavator rate of production is 15-25 bars/hr. Estimate construction just prior to compaction, no additional allowance made for compaction.	Each	Estimate by Materials, Time & Equipment	
204	<u>Permanent Water Bars</u> : Constructed to design depth and location. Dozer rate of production is 3-4 bars/hour	Each	Estimate by Materials, Time & Equipment	

Parent Specification	Description of Work	Pay Unit	Estimated Cost	Percent Labor
204	<u>Construction Dips</u>	Each	Estimate by Materials, Time & Equipment	

SECTION 158. – WATERING FOR DUST CONTROL

Develop Water Supply and Watering (Labor 40-70 percent)

Estimated Quantity of Water for Compaction

- For embankment - 5-10 gal/CY
- For base and surface courses - 35-44 gal/CY or 20-25 gal/ton.

Cost to Develop Water Supply

Watering cost includes installing either a pump or gravity system to fill the tanker, filling time, and haul.

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.

- **Estimating development of water source.** If any other work or factor is required such as digging a basin or inspections for biological control, 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 using Table 15. Fixed Haul Cost (\$/M Gallon and \$/Ton) for a 3000 Gallon Water Truck in Idaho and Montana or Table 16. Variable Haul Cost (\$/M Gallons-Mile and \$/Ton-Mile) for a 3000 Gallon Water Truck in Idaho and Montana (refer to HAUL in Section 204. - EXCAVATION AND EMBANKMENT for more information related to fixed and variable haul.). Center of project is the center of embankment mass for excavation and linear center of project for base and surfacing.

Table 15. Fixed Haul Cost (\$/M Gallon and \$/Ton) for a 3000 Gallon Water Truck in Idaho and Montana

Truck Type	Idaho \$/M Gallon	Idaho \$/Ton	Montana \$/M Gallon	Montana \$/Ton
3000 Gallon Water Truck	\$8.13	\$1.95	\$8.52	\$2.04

Table 16. Variable Haul Cost (\$/M Gallons-Mile and \$/Ton-Mile) for a 3000 Gallon Water Truck in Idaho and Montana

mph	Idaho \$/MGallons-Mile	Idaho \$/Ton-Mile	Montana \$/MGallons-Mile	Montana \$/Ton-Mile
10	\$6.51	\$1.56	\$6.81	\$1.63

mph	Idaho \$/MGallons-Mile	Idaho \$/Ton-Mile	Montana \$/MGallons-Mile	Montana \$/Ton-Mile
15	\$4.34	\$1.04	\$4.54	\$1.09
20	\$3.25	\$0.78	\$3.41	\$0.82
25	\$2.60	\$0.62	\$2.73	\$0.65
30	\$2.17	\$0.52	\$2.27	\$0.54
40	\$1.63	\$0.39	\$1.70	\$0.41
50	41.30	\$0.31	\$1.36	\$0.33

The rates for ton-mile has been figured using 240 gallons/ton.

PART IV. DIVISION 200 EARTHWORK

SECTION 201. - CLEARING AND GRUBBING

(Labor 20-55 percent)

Note that timber volume units have changed from previous Editions of Cost Estimating Guide for Road Construction.

Timber volumes are expressed in CCF (100 cubic feet) since timber volumes in the Northern Region are usually expressed in CCF or Tons. Approximate conversion is 1 CCF = 0.5 MBF.

There are too many variables reflected in the bids to use them solely as a basis for costs. Therefore costs provided in this Section are 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 may need to be adjusted to meet total mechanical clearing.

Clearing Classification

There are two methods of classification.

1. Classification by volume per acre of timber within clearing limits
2. Classification by Stand Description

Classification by volume per acre of timber within clearing limits

The classification of clearing by volume per acre are shown on Figure 1, Figure 2, Figure 3, and Figure 4. It is essential that timber volumes be estimated within accuracy standards. Estimators should request gross volume figures 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 0.0 to 1.2 is appropriate.

Example:

Gross volume from timber cruise = 24 CCF/Acre

Gross down volume = 12 CCF/Acre

Factor for down material = 0.5

Volume for classification: $24\text{CCF/Acre} + (12\text{ CCF/Acre} \times 0.5) = 30\text{ CCF/Acre}$

Base Cost

Figures 1, 2, 3, and 4 provide the base \$/Acre. Estimate includes a hydraulic excavator for clearing/pioneering. Clearing may need to be adjusted to meet total mechanical clearing. Slash Treatment factor was based on windrow.

Figures 1 and 2 differ from 3 and 4 by allowances for logging the Right-of-way timber. Logging cost for right-of-way timber on timber sales is included as a logging cost in timber sale appraisals. Therefore the

only logging cost included in the Timber to Timber Sale Purchaser (Figure 1 and 2) is an allowance for the decking of the right-of-way timber.

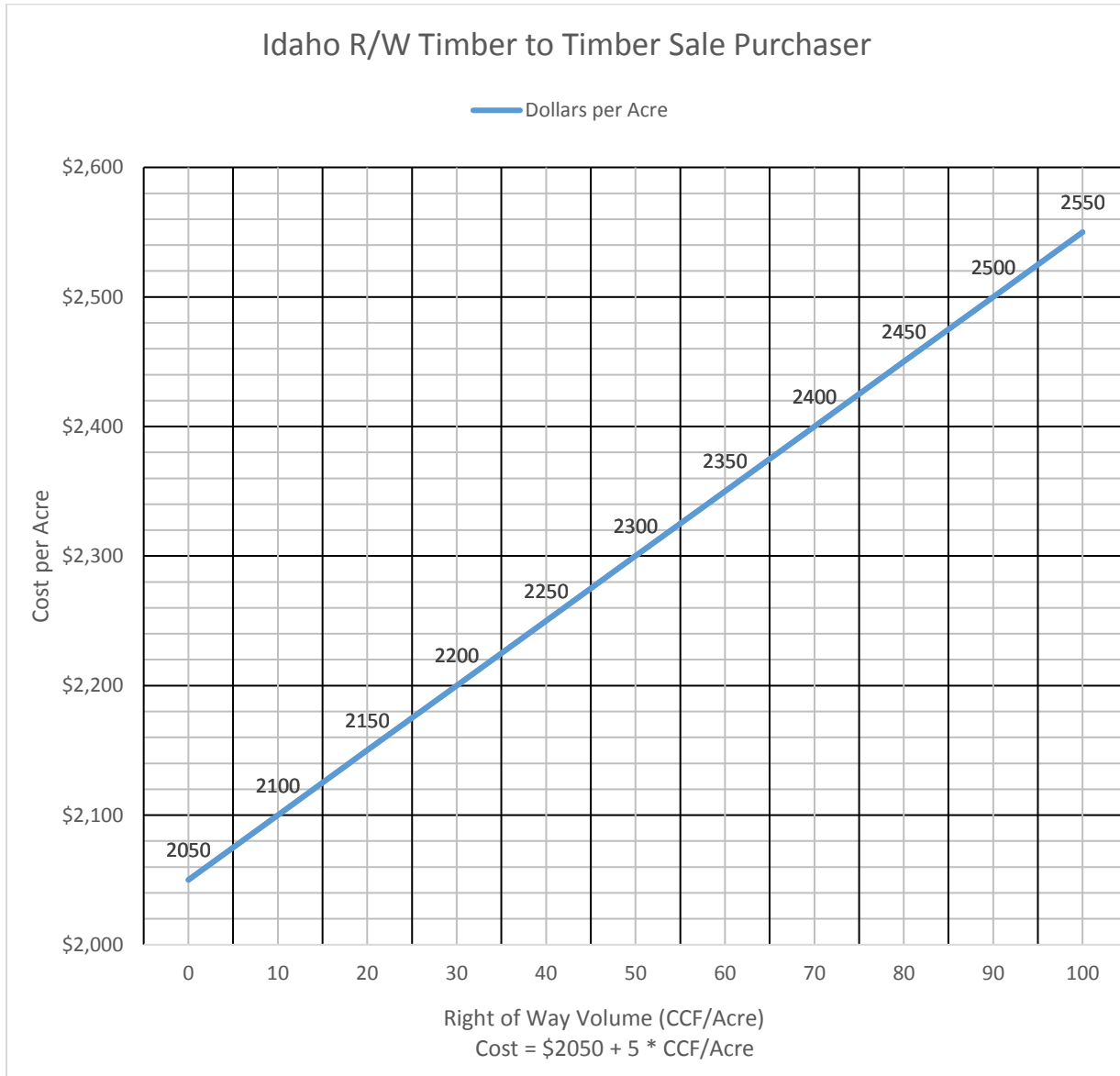


Figure 1. Clearing and Grubbing Base Rate - Idaho R/W Timber to Timber Sale Purchaser (\$/Acre)

Right of Way Volume (CCF/Acre)	0	10	20	30	40	50	60	70	80	90	100
\$/Acre	\$2050	\$2100	\$2150	\$2200	\$2250	\$2300	\$2350	\$2400	\$2450	\$2500	\$2550

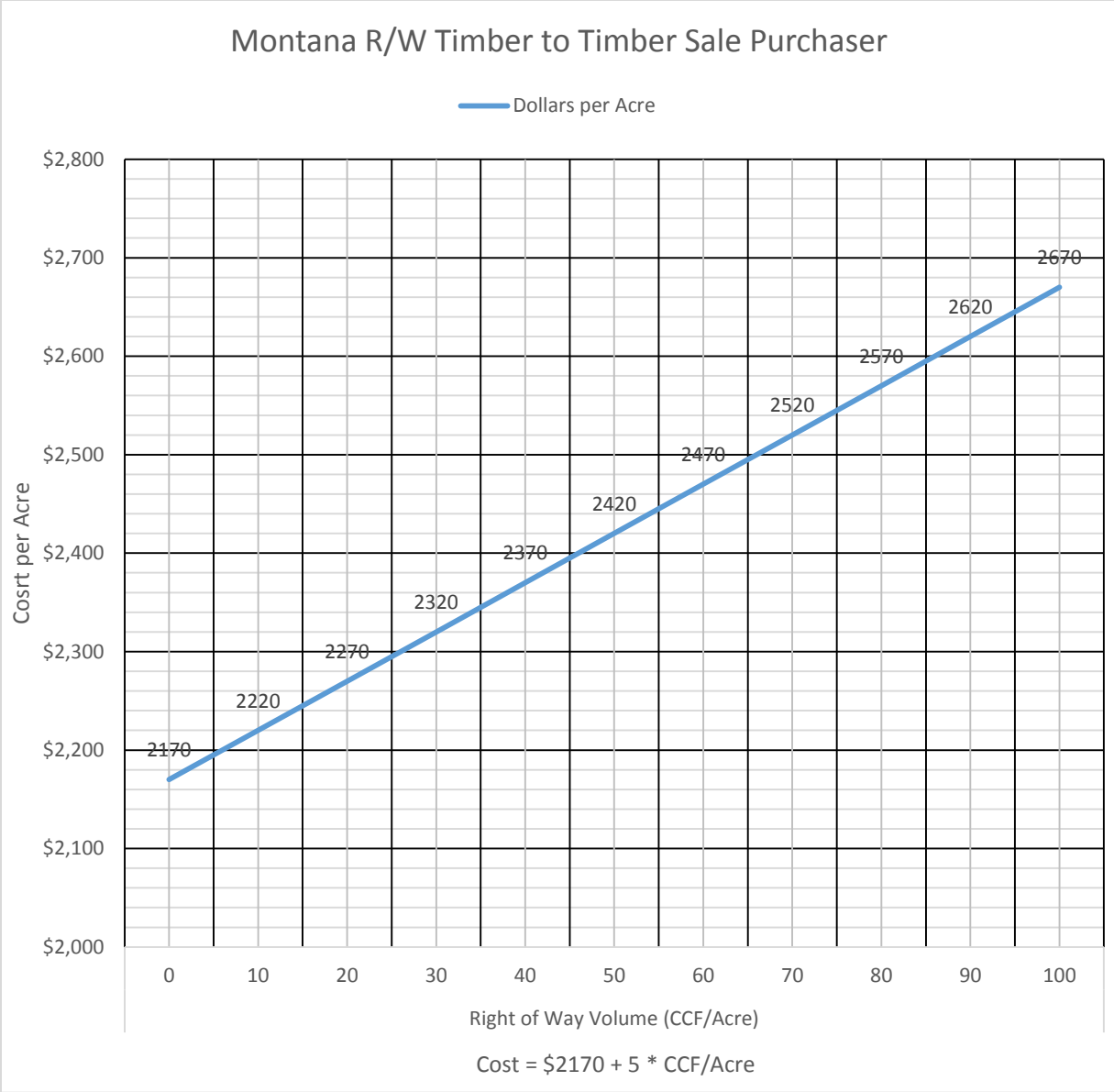


Figure 2. Clearing and Grubbing Base Rate – Montana R/W Timber to Timber Sale Purchaser (\$/Acre)

Right of Way Volume (CCF/Acre)	0	10	20	30	40	50	60	70	80	90	100
\$/Acre	\$2170	\$2220	\$2270	\$2320	\$2370	\$2420	\$2470	\$2520	\$2570	\$2620	\$2670

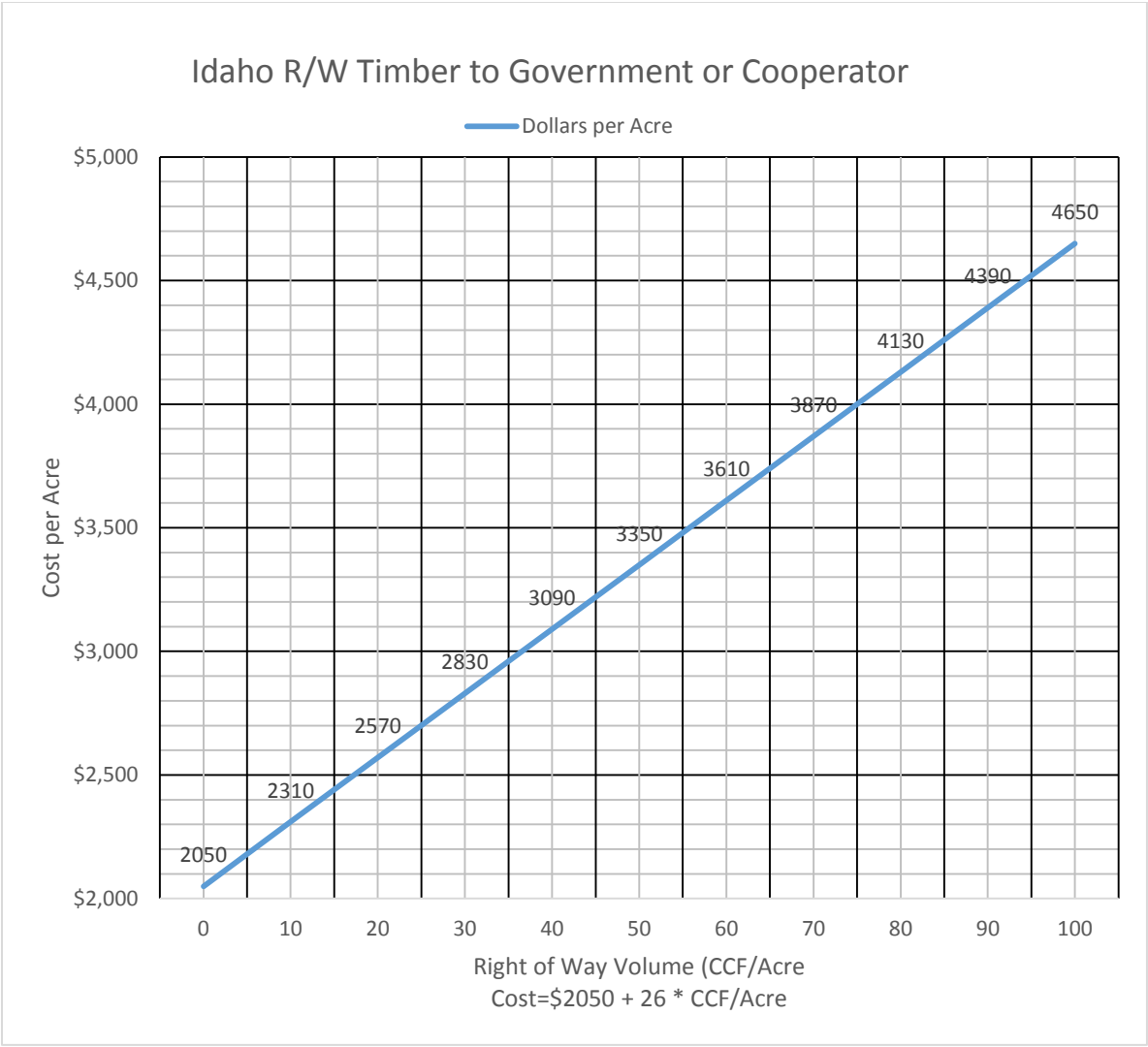


Figure 3. Clearing and Grubbing Base Rate– Idaho R/W Timber to Government or Cooperator (\$/Acre)

Right of Way Volume (CCF/Acre)	0	10	20	30	40	50	60	70	80	90	100
\$/Acre	\$2050	\$2310	\$2570	\$2830	\$3090	\$3350	\$3610	\$3870	\$4130	\$4390	\$4650

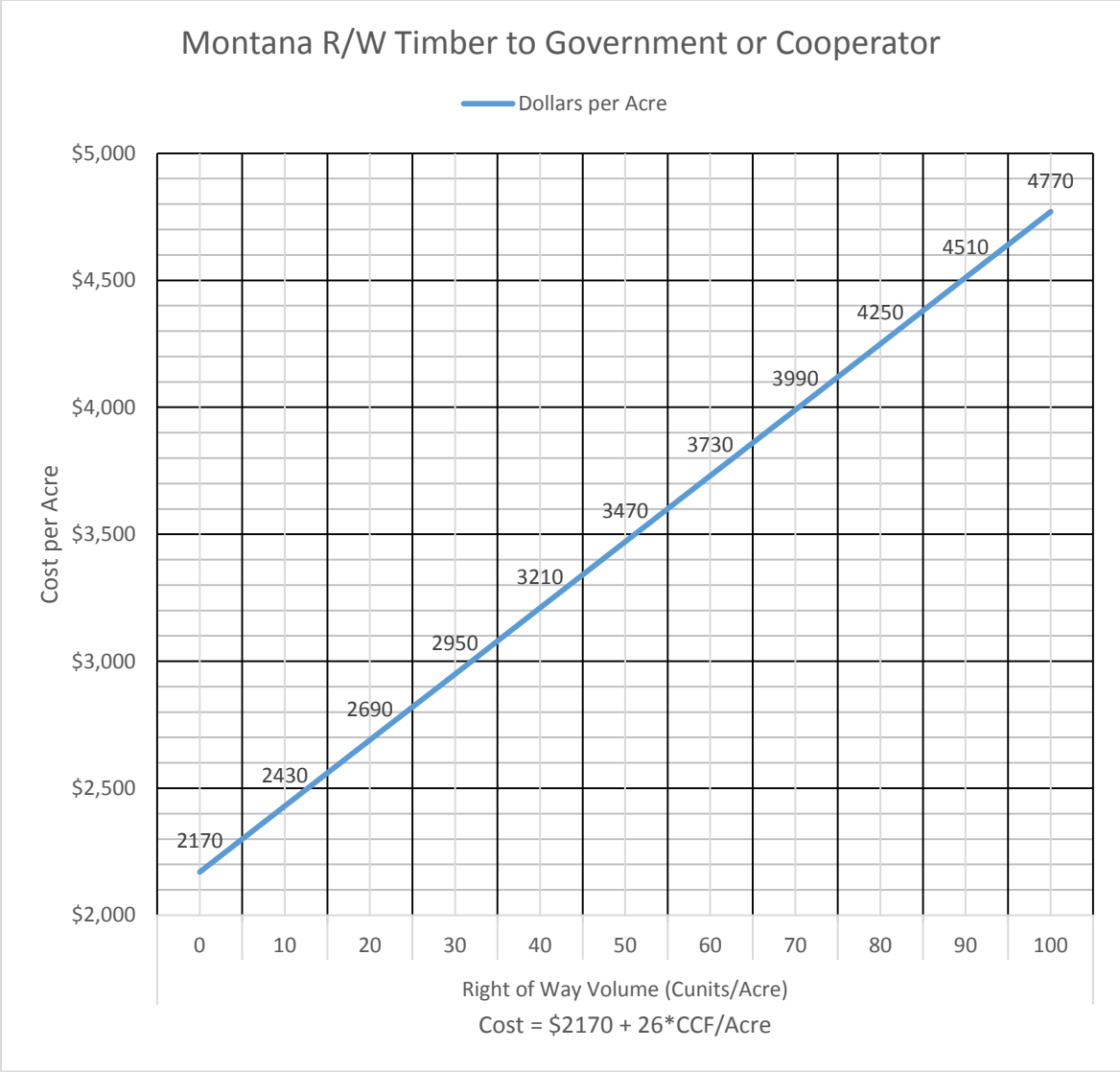


Figure 4. Clearing and Grubbing Base Rate – Montana R/W Timber to Government or Cooperator (\$/Acre)

Right of Way Volume (CCF/Acre)	0	10	20	30	40	50	60	70	80	90	100
Dollars per Acre	\$2170	\$2430	\$2690	\$2950	\$3210	\$3470	\$3730	\$3990	\$4250	\$4510	\$4770

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 5. Additional items to be considered are the amount and size of down material and the size of stumps and limbs.

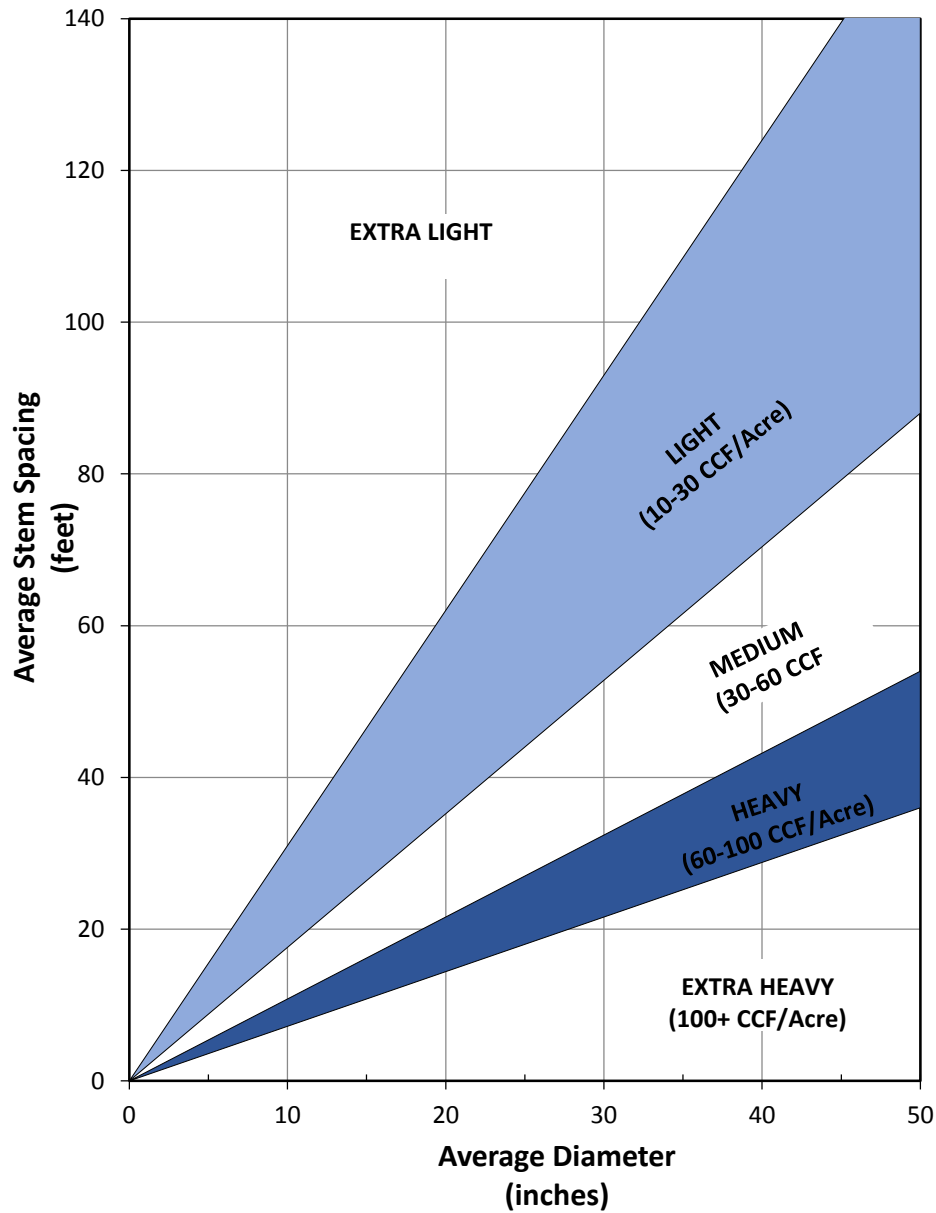


Figure 5. Equivalent Volume Using Average Diameters and Stem Spacing

Description of Classification

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.

Base Cost

Refer to Figures 1, 2, 3, and 4 for base \$/Acre.

Topographic Factor

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

Table 17. Adjustment Factor for Percent Ground Slope

Ground Slope	Factor
Gentle (under 20 percent)	1.1
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 – Factor = 1.4-2.0

Slash Treatment Factor (Disposal of Clearing and Grubbing Debris)

Clearing estimates must be based on the lowest cost treatment option allowable to the contractor. 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. 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.

Table 18. Adjustment Factor for Slash Treatment Method

Slash Treatment Method	Factor
(a) Remove from Project	Estimate by Time and Equipment
(b) Burn	1.5 - 2.0
(c) Bury	1.5 – 2.0
(e) Windrow	1.0 - 1.35
(f) Scattering	1.15 – 1.35
(g) Chipping	1.75 - 2.0
(h) Debris Mat	Estimate by Time and Equipment
(i) Decking	1.1
(j) Remove to Designated Location	2

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.

Table 19. Adjustment Factor for Slash Treatment of Tops & Limbs, Logs, and Stumps

Description	Tops & Limbs	Logs	Stumps
Typical	40%	35%	25%
If Burn is designated for Stumps:	30%	20%	50%

Example – Slash Treatment of tops & limbs, logs, and stumps

Given: Slash Treatment Methods for Tops and Limbs = Burn; Logs = Windrow; Stumps = Scatter

Solution:

Adjustment Factor for Slash Treatment

$$= (\% \text{ Tops \& Limb} \times \text{Method factor}) + (\% \text{ Logs} \times \text{Method factor}) \\ + (\% \text{ Stumps} \times \text{Method factor})$$

$$(0.40 \times 1.6) + (0.35 \times 1.0) + (0.25 \times 1.15) = 1.28$$

Other Factors:

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 lodge pole pine stands. The cost allowances for these situations should consider the treatment of tops and limbs, and logs, but not stumps. The factors for each of these is shown above. Clearing costs associated with campgrounds will normally be higher.

Example - Clearing and Grubbing Cost:

Given:

Idaho, Kootenai County, labor 40%

Timber Volume: standing volume 24 CCF/acre, down volume 12 CCF/acre; $24 + 12/2 = 30$ CCF/acre

Slope 15%. Factor = 1.1

Slash Treatment per previous example. Factor = 1.28

Adjustment factor from Table 1. Adjustment Factor for Public Works Davis-Bacon Zones= 1.02

Adjustment factor from Table 3. Adjustment Factor for Construction Wage Rate Differentials = 1.15

Solution:

Engineers Estimate (Public Works) –

Base Rate is from Figure 3. Clearing and Grubbing Base Rate– Idaho R/W Timber to Government or Cooperator (\$/Acre)

$$\text{Clearing Cost/Acre} = \text{Base Rate} \times \text{Slope Factor} \times \text{Slash Disposal} \times \text{DB Factor}$$

$$(\$2,830 \times 1.1 \times 1.28 \times 1.02 = \$4,065/\text{Acre}$$

Timber Sale –

Base Rate is from Figure 1. Clearing and Grubbing Base Rate - Idaho R/W Timber to Timber Sale Purchaser (\$/Acre)

$$\text{Clearing Cost/Acre} = (\text{Base Rate} \times \text{Slope Factor} \times \text{Slash Disposal} \times \text{DB Factor})/\text{WR Factor}$$

$$(\$2,200 \times 1.1 \times 1.28 \times 1.02)/1.15 = \$2,745/\text{Acre}$$

Clearing Existing Road (Labor 50-90)

This is for existing roads. The designer will need to consider the uniqueness of the project and estimate accordingly. Consider the area being cleared and the type of equipment that can operate safely. Consider the spacing as well as the diameter of the trees and brush to be cleared when classifying the material. The topographic factors and the ground cover should be considered when selecting the type of equipment and slash treatment method to be used. If equipment cannot operate safely use the hand labor factor.

Light (\$400-\$750/mile)

Few trees and low brush scattered along the shoulders of the roadway. Production rate approximately 1000 feet per hour.

Medium (\$750-\$1500/mile)

Trees and brush along the entire length of the shoulders of the roadway. Production rate approximately 750 feet per hour.

Heavy (\$1500-\$3000/mile)

Trees and brush scattered throughout the entire roadway. This cost range considers the grubbing of the roadbed. Production rate approximately 400 feet per hour.

Extra Heavy (\$3000-\$4000/mile)

Trees and brush densely spaced along the entire roadway. This cost range considers the grubbing of the roadbed. Production rate approximately 200 feet per hour.

Topographic Factor

Assume work is being accomplished along an existing roadbed with cuts and fills needing special attention. The unit cost should be adjusted by the factors shown above in Table 16. ADJUSTMENT FACTOR FOR PERCENT GROUND SLOPE

Labor Factor

Labor factor of 1.25 should be applied to projects that do not use a machine to do at least part of the brushing operation.

Slash Treatment Factor

The unit cost should be adjusted by the factors shown above in Table 17. ADJUSTMENT FACTOR FOR SLASH TREATMENT METHOD.

SECTION 202. - ADDITIONAL CLEARING AND GRUBBING

(Labor 50-90 percent)

Estimate similar to Section 201. - CLEARING AND GRUBBING

Individual Removal of Trees

(Labor 80 percent)

This includes falling and treating trees that lie outside of the clearing limits. Tree removal only includes falling and not grubbing. Average cost: \$30 per tree. Include this in the Engineer's Estimate but not in the Specified Road Cost if the trees are merchantable.

SECTION 203. - REMOVAL OF STRUCTURES AND OBSTRUCTIONS

(Labor 30-50 percent)

Removal of Existing Bridges

This item should 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 Equipment Rates and Labor Rates).

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 Equipment Rates and Labor Rates).

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.

Disposal of Clearing and Grubbing Debris

Refer to Slash Treatment Factor (Disposal of Clearing and Grubbing Debris) in Section 201. - CLEARING AND GRUBBING.

SECTION 204. - EXCAVATION AND EMBANKMENT

(Labor 20-45 percent)

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.

Conservation of Topsoil

Excavated material conserved from the roadway excavation and embankment foundation areas that is suitable for growth of grass, cover crops, or native vegetation.

Table 20. Conservation of Top Soil (\$/STA)

Method	Idaho	Montana
Stripping topsoil and windrowing with grader, relatively flat ground:	\$12.69/STA	\$13.52 /STA
Stripping topsoil with tracked loader and placing in stockpile within 300 ft.	\$24.02/STA	\$25.49 /STA

Drainage Feature

(Labor 30%)

Drainage feature includes construction of all ditches, minor channel changes, drainage dips, catch basins, surface water deflectors, and other minor drainage structures.

Catch Basin

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. See Section 602. - CULVERTS AND DRAINS.

Separate pay items should be used, one for construction of catch basins and one for culvert installation.

Ditch

Drainage excavation can be estimated most easily by the linear 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 \$150 to \$400 each depending on material and distance between dips.

Earth Berms

(Labor 30%)

Idaho \$0.16/LF and Montana \$0.17/LF

Base Cost for Common Excavation

The average BASE COST of common excavation is **\$1.92/CY** for Idaho and **\$2.03/CY** for Montana.

Add the following adjustment factors to the Base Cost for Common Excavation as needed.

Table 21. Material Adjustment Factor

Material Type	Factor
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

Table 22. Loading Material into Trucks (\$/CY)

Material Type	Idaho	Montana
Common and loose rock	\$1.01	\$1.07
Ripped rock	\$1.46	\$1.55
Blasted rock and large boulders	\$1.74	\$1.85

Conservation of Rock:

Conservation of rock is included in Base Cost for Common Excavation when excavating with a dozer or excavator and placing in small stockpile within 300 ft.

When excavating and hauling to central stockpile or use point, add the Loading Material into Truck rate.

Haul:

Station Yards is used when material is moved using dozer pushes. Cubic yard-mile is used when material is hauled by truck.

Add Haul at the rate of \$0.17/Station Yard for Idaho and \$0.18/Station Yard for Montana

Preparing Foundation for Embankment Construction

Table 23. Scarifying (\$/STA)

Description	Idaho Single Lane	Montana Single Lane	Idaho Double Lane	Montana Double Lane
Light (< 6" depth)	\$12.84/STA	\$13.68/STA	\$17.34/STA	\$18.47/STA
Average (6" depth)	\$17.13/STA	\$18.25/STA	\$23.12/STA	\$24.64/STA
Heavy (> 6" depth)	\$26.77/STA	\$28.53/STA	\$36.14/STA	\$38.51/STA

Table 24. Adjustment Factor for Bench Fill Slope

Slope	Idaho	Montana
30-45 percent	\$1.01/LF	\$1.07/LF
45-60 percent	\$1.60/LF	\$1.70/LF

Note - If hydraulic excavators are used, there will be no adjustment factor applied for bench fill slope because work will be done during clearing/pioneering.

Embankment - Compaction Placement Method

Adjustment factor does not include water for adjusting moisture content, make an allowance or estimate under Section 158. – WATERING FOR DUST CONTROL.

Table 25. Adjustment Factor for Compaction Placement Method

Compaction Placement Method	Idaho \$/CY	Montana \$/CY
Placement Method 1(1) – More than 80% retained on a No.4 Sieve	\$1.09	\$1.15
Placement Method 1(2) – 50% to 80% retained on a No.4 Sieve	\$1.23	\$1.31
Placement Method 1(3) – Less than 50% retained on a No. 4 Sieve	\$1.38	\$1.46
Placement Method 2 – Roller Compaction, no testing	\$0.95	\$1.00
Placement Method 3 – Hauling and Spreading Equipment, three passes	\$0.60	\$0.64
Placement Method 4 – Hauling and Spreading Equipment (Cost Range Given)	\$0.55 - \$0.60	\$0.59 – \$0.64
Placement Method 5 – Excavator Bucket	\$0.89	\$0.94
Placement Method 6 – Mechanical Tamper	\$7.99	\$8.29

Compaction Prior to Aggregate Base and Surfacing.

Costs are based upon grading and compacting based Placement Method 2:

Table 26. Costs for Compaction Prior to Aggregate Base and Surfacing

Lanes	Idaho	Montana
Single Lane	\$5.83/STA	\$6.15/STA
Double Lane	\$7.51/STA	\$7.91/STA

Sloping

Slope Blending:

Depending on material and type of slope blending specified, additional costs of \$0.05/LF to \$0.15/LF are applicable. This assumes the work being done at start of excavation immediately following pioneering. Slope rounding is a more deliberate practice.

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 can be done by a hydraulic excavator. Estimate by time and equipment

Shaping and Finishing

The cost of Shaping and Finishing is related to the required construction tolerances. Construction Tolerance Class is defined in FSSS 204. The number of lanes and if there is a ditch are also variables to consider for Shaping and Finishing.

Table 27. Shaping and Finishing - Single Lane Roads without Ditch (\$/STA)

Tolerance Class	A	B/C	D/E	F/G/H	I/J/K/L/M
Rate (days/mi)	2.14	1.61	0.81	0.53	0.28
Idaho (\$/STA)	\$48.01	\$36.21	\$18.11	\$11.82	\$6.30
Montana (\$/STA)	\$51.16	\$38.58	\$19.30	\$12.59	\$6.71

Table 28. Shaping and Finishing - Double Lane Roads without Ditch (\$/STA)

Tolerance Class	A	B/C	D/E	F/G/H	I/J/K/L/M
Rate (days/mi)	1.58	1.19	0.60	0.39	0.21
Idaho (\$/STA)	\$64.82	\$48.88	\$24.45	\$15.95	\$8.50
Montana (\$/STA)	\$69.06	\$52.08	\$26.05	\$17.00	\$9.06

Table 29. Shaping and Finishing - Single Lane Roads with Ditch (\$/STA)

Tolerance Class	A	B/C	D/E	F/G/H	I/J/K/L/M
Rate (DAYS/MILE)	3.71	2.38	1.05	0.81	0.53
Idaho (\$/STA)	\$83.42	\$53.52	\$23.61	\$18.11	\$11.88
Montana (\$/STA)	\$88.89	\$57.03	\$25.16	\$19.30	\$12.66

Table 30. Shaping and Finishing - Double Lane Roads with Ditch (\$/STA)

Tolerance Class	A	B/C	D/E	F/G/H	I/J/K/L/M
Rate (days/mi)	2.75	1.76	0.78	0.60	0.39
Idaho (\$/STA)	\$112.62	\$72.26	\$31.88	\$24.45	\$16.03
Montana (\$/STA)	\$120.00	\$76.99	\$33.97	\$26.05	\$17.08

Earthwork Calculation Example

Given: Single lane, aggregate surfaced road with ditch,
 Compaction: Placement Method 2, Tolerance Class G, 30% labor;
 Excavation: 80,000 CY; 70 percent common; 15 percent rippable rock; 15 percent blasting rock
 Benching: 30-45 % slope - 1500 LF; 45-60% - 2500 LF
 Scarifying: Light - 115 Stations; Average – 72 Stations; Heavy - 15 Stations
 Shaping and Finishing: Single Lane with Ditch - 262 Stations
 Compaction prior to aggregate base: 262 Stations

Find: \$/CY for Location A: Idaho – Kootenai County and Location B: Montana - Zone 3

Solution - Location A. Idaho Kootenai County

Base Cost for Common Excavation

Material Type:	CY	x	Percent Material Type	x	Base Excavation Cost	x	Material Adjustment Factor	=	Cost
Common:	80,000	x	0.7	x	\$1.92	x	1.00	=	\$107,520.00
Rippable:	80,000	x	0.15	x	\$1.92	x	3.00	=	\$69,120.00
Blast:	80,000	x	0.15	x	\$1.92	x	5.00	=	\$115,200.00

Additions to Base Excavation

Benching Fill Slopes:	Linear Foot	x	\$/Linear Foot	=	Cost
30-45 percent:	1,500	x	1.01	=	\$1,515.00
46-60 percent:	2,500	x	1.60	=	\$4,000.00

Compaction Method 2

Quantity	x	Adjustment	=	Cost
80,000	x	0.95	=	\$76,000.00

Scarifying:

Description	Stations	x	\$/Station	=	Cost
Light:	115	x	\$12.84	=	\$1,453.60
Average:	72	x	\$17.13	=	\$1,233.36
Heavy:	15	x	\$26.77	=	\$401.55

Shaping and Finishing

Tolerance Class	Stations	x	\$/Station	=	Cost
G	262	x	\$18.11	=	\$4,744.82

Compaction Prior to Aggregate Base and Surfacing.

Stations	x	\$/Station	=	Cost
262	x	\$5.83	=	\$1,527.46

Total Costs

Total Engineers Estimate w/o Quality Control	=	\$382,715.79
Quality Control - 1% of Total Engineers Est.	=	\$3,827.16
Total Engineers Estimate including Quality Control	=	\$386,542.95

Unit Cost Calculation without Quality Control

\$/CY = \$382,715.79 / 80,000 CY= \$4.78

Unit Cost Calculation with Quality Control

$\$/CY = \$386,542.95 / 80,000\ CY = \4.83

Location A- Calculation

		ADJUSTMENT FACTOR FOR PUBLIC WORKS DAVIS- BACON ZONES			Adjusted
Idaho Kootenai County	\$/CY	x		=	\$/CY
Unit Cost Calculation without Quality Control	\$4.78	x	1.02	=	\$4.88
Unit Cost Calculation with Quality Control	\$4.83	x	1.02	=	\$4.92

		ADJUSTMENT FACTOR FOR CONSTRUCTION WAGE RATE DIFFERENTIALS			Adjusted
Idaho Kootenai County	\$/CY	x		=	\$/CY
Specified Road Cost without Quality Control	\$4.88	/	1.11	=	\$4.40

Solution - Location A. Location B. Montana Zone 3*Base Cost for Common Excavation*

Material Type:	CY	x	Percent Material Type	x	Base Excavation Cost	x	Material Adjustment Factor	=	Cost
Common:	80,000	x	0.7	x	\$2.03	x	1.00	=	\$113,680.00
Rippable:	80,000	x	0.15	x	\$2.03	x	3.00	=	\$73,080.00
Blast:	80,000	x	0.15	x	\$2.03	x	5.00	=	\$121,800.00

Additions to Base Excavation

Benching Fill Slopes:	Linear Foot	x	\$/Linear Foot	=	Cost
30-45 percent:	1,500	x	1.07	=	\$1,605.00
46-60 percent:	2,500	x	1.07	=	\$4,250.00

Compaction Method 2

Quantity	x	Adjustment	=	Cost
80,000	x	1.00	=	\$80,000.00

Scarifying:

Description	Stations	x	\$/Station	=	Cost
Light:	115	x	\$13.68	=	\$1,573.20
Average:	72	x	\$18.25	=	\$1,314.00
Heavy:	15	x	\$28.53	=	\$427.95

Shaping and Finishing

Tolerance Class	Stations	x	\$/Station	=	Cost
G	262	x	\$19.30	=	\$5,056.60

Compaction Prior to Aggregate Base and Surfacing.

Stations	x	\$/Station	=	Cost
262	x	\$6.15	=	\$1,611.30

Total Costs

Total Engineers Estimate w/o Quality Control	=	\$404,398.05
Quality Control - 1% of Total Engineers Est.	=	\$4,043.98
Total Engineers Estimate including Quality Control	=	\$408,442.03

Unit Cost Calculation without Quality Control

$$\$/\text{CY} = \$404,398.05 / 80,000 \text{ CY} = \$5.05$$
Unit Cost Calculation with Quality Control

$$\$/\text{CY} = \$408,442.03 / 80,000 \text{ CY} = \$5.10$$
Location B- Calculation

Montana Zone 3	\$/CY	x	ADJUSTMENT FACTOR FOR PUBLIC WORKS DAVIS- BACON ZONES	=	Adjusted \$/CY
Unit Cost Calculation without Quality Control	\$5.05	x	1.00	=	\$5.05
Unit Cost Calculation with Quality Control	\$5.10	x	1.00	=	\$5.10

Montana Zone 3	\$/CY	x	ADJUSTMENT FACTOR FOR CONSTRUCTION WAGE RATE DIFFERENTIALS	=	Adjusted \$/CY
Specified Road Cost without Quality Control	\$5.05	/	1.10	=	\$4.59

HAUL

Labor: Cubic yard-Mile 35 percent; Station Yard 25 percent.

The haul of asphalt and aggregate may be a contract item. If so, do not reduce, if the subcontractor is expected to pay Construction Wage Rate (Davis-Bacon) wages

Refer to Table 15. Fixed Haul Cost (\$/M Gallon and \$/Ton) for a 3000 Gallon Water Truck in Idaho and Montana and Table 16. Variable Haul Cost (\$/M Gallons-Mile and \$/Ton-Mile) for a 3000 Gallon Water Truck in Idaho and Montana in Section 158. – WATERING FOR DUST CONTROL for hauling of water.

Note: Haul is not a pay item, costs need to be included in the appropriate items of work

Station Yards is used when material is pushed by a dozer more than 200 feet. Cubic yard-mile is used when material is hauled by truck.

Cost for Haul, in Idaho \$0.17/Station Yard; and \$0.50 to \$1.00/Cubic Yard-Mile depending on haul distance, road conditions, etc.

Cost for Haul, in Montana is \$0.18/ Station Yard; and \$0.50 to \$1.00/Cubic Yard-Mile depending on haul distance, road conditions, etc.

Cost for Cubic Yard-Mile haul of excavation, aggregate, riprap, and borrow excavation should be derived with the use of the following procedure.

Haul of material includes the fixed costs (for the truck only) of spotting, load, and turnaround in addition to the variable "underway" cost while hauling equipment is moving.

Loading costs (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 (CF) adjustment 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, and riprap, the compaction factor (CF), must be adjusted to fit the method of measurement; such as in place, vehicle quantity, or compacted in place. The costs per ton shown below are based upon 1.35 tons per cubic yard. Note that haul of excavation, when authorized as a pay item, is usually calculated by the cubic-yard-mile. Haul of materials that are weighed in tons are calculated in ton-miles.

When computing variable haul cost, the estimator should consider all the factors that affect the haul over each segment of the haul route. These factors include grade, alignment, road width, surface type, road condition, sight distance, turnout spacing, and other traffic using the road. Use the correct truck for the type of road used for 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 turn-around 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 the appropriate allowance.

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

Table 31. Average Roundtrip Travel Speeds Based on Road Characteristics

Average Travel Speed	Road Characteristics
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

Haul Fixed Cost

Fixed cost include 10 minutes for a 10-12 CY End Dump and 15 minutes for an 18 CY Bottom Dump to load, unload, and turn around. Apply it to CY or ton and not Cubic Yard-Mile or Ton-Mile. Fixed costs may need to be increased in difficult or unique situations in loading or dumping material, such as asphalt or riprap.

Table 32. Fixed Cost per Cubic Yard and Ton for Idaho and Montana

Truck Type	Idaho \$/CY	Idaho \$/Ton	Montana \$/CY	Montana \$/Ton
10-12 CY End Dump	\$2.28	\$1.69	\$2.43	\$1.80
18 CY Bottom Dump	\$2.00	\$1.48	\$2.13	\$1.58

Variable Haul Cost

Variable Haul Cost is a measure of the cost to haul a cubic yard a mile (or a ton a mile).

The following is an example format to be used for computing variable cost.

Road Segment	Average Speed Roundtrip (mph)	Length (Miles)	\$/Cubic Yard-Mile (\$/Ton-Mile)	Loose CY (Tons)	Variable Haul Cost
Enter mile post description for the road segment	Enter the average speed for road segment	Enter miles for road segment	Enter cost from Variable Haul Cost table	Enter the quantity for road segment	Length x \$/CY-Mile x CY

Table 33. Variable Haul Cost (\$/Cubic Yard-Mile and \$/Ton-Mile) by Truck Type for Idaho And Montana

	Idaho 10-12 CY End Dump \$/CY- Mile	Idaho 10-12 CY End Dump \$/Ton- Mile	Idaho 18 CY Bottom Dump \$/CY- Mile	Idaho 18 CY Bottom Dump \$/Ton- Mile	Montana 10-12 CY End Dump \$/CY- Mile	Montana 10-12 CY End Dump \$/Ton- Mile	Montana 18 CY Bottom Dump \$/CY- Mile	Montana 18 CY Bottom Dump \$/Ton- Mile
mph								
10	\$2.74	\$2.03	\$1.60	\$1.19	\$2.92	\$2.16	\$1.70	\$1.26
15	\$1.82	\$1.35	\$1.07	\$0.79	\$1.94	\$1.44	\$1.14	\$0.84
20	\$1.37	\$1.01	\$0.80	\$0.59	\$1.46	\$1.08	\$0.85	\$0.63
25	\$1.09	\$0.81	\$0.64	\$0.47	\$1.17	\$0.86	\$0.68	\$0.51
30	\$0.91	\$0.68	\$0.53	\$0.40	\$0.97	\$0.72	\$0.57	\$0.42
40	\$0.68	\$0.51	\$0.40	\$0.30	\$0.73	\$0.54	\$0.43	\$0.32
50	\$0.55	\$0.41	\$0.32	\$0.24	\$0.58	\$0.43	\$0.34	\$0.25

The *total haul cost* is the sum of the variable costs plus fixed costs.

$$\text{Total Haul Cost} = \text{Total Variable Cost} + \text{Total Fixed Costs}$$

Haul Calculation Example

Given: Montana Zone 1

10-12 End Dump, 30 mph, 5 mile haul

500 LOOSE CY

Road Segment	Average Speed Roundtrip (mph)	Length (Miles)	\$/Cubic Yard-Mile (\$/Ton-Mile)	Loose CY (Tons)	Variable Cost
MP 5.0	30	5	\$0.97	500	\$2425

$$\text{Fixed Cost} = 500 \text{ CY} \times \$2.43 = \$1215$$

$$\text{Total Haul Cost} = \$2425 + 1215 = \$3640$$

$$\text{Unit Haul Cost} = \frac{\$3640}{500 \text{ CY}} = \$7.28/\text{CY}$$

$$\text{Engineers Estimated Unit Cost} = \frac{\$}{\text{CY}} \times \text{ADJUSTMENT FACTOR FOR PUBLIC WORKS DAVIS - BACON ZONES}$$

$$\text{Engineers Estimated Unit Cost} = \$7.28 \times 0.97 = \$7.06$$

$$\text{Specified Road Unit Cost} = \frac{\$/\text{CY}}{\text{ADJUSTMENT FACTOR FOR CONSTRUCTION WAGE RATE DIFFERENTIALS}}$$

$$\text{Specified Road Unit Cost} = \frac{\$7.06}{1.12} = \$6.30$$

SECTION 208. - STRUCTURE EXCAVATION AND BACKFILL FOR SELECTED MAJOR STRUCTURES

(Labor 50 percent)

Typical quantities of structure excavation range from 250 CY for small bridges to 2000 CY for deep culvert replacements. Costs range from \$20/CY for smaller quantities to \$10/CY for larger quantities. Material type (larger boulders, solid rock, and sandy soils) should be taken into consideration when estimating the cost of structure excavation. If applicable include an appropriate allowance in this pay item for contractor quality control.

Dewatering and erosion control plans should be include under Section 157. - SOIL EROSION AND SEDIMENT CONTROL.

SECTION 209. - STRUCTURE EXCAVATION AND BACKFILL

(Labor 50 percent)

Costs including excavation are included in the unit cost for culverts up to 36" in diameter and CMPAs up to 42" x 29". See Section 602. - CULVERTS AND DRAINS.

This section is to estimate the excavation, backfill and compaction for larger culverts. As stated in Section 209.12 Measurement and Payment, do not measure structure excavation and backfill for payment. These costs are to be included in the other pay items such Section 602. - CULVERTS AND DRAINS or Section 208. - STRUCTURE EXCAVATION AND BACKFILL FOR SELECTED MAJOR STRUCTURES.

SECTION 211. - ROADWAY OBLITERATION

(Labor 40 percent)

Obliteration may range from ripping and scarifying the road surface, removing culverts, and rounding off the cut slope to complete removal of the road template and recontouring to the original natural profile. A laborer should be included to seed/fertilize behind the equipment.

This work is generally performed from the end of the road to the beginning. Estimator needs to consider the existing condition of the road. Clearing and excavation may be required to access the end of the road to perform the roadway obliteration with the required equipment.

Table 34 Range of Costs per Mile by Closure Device and Mitigation Treatment for Road Obliteration

Closure Device	Mitigation	Cost Range ¹ (\$/MILE)
Gate	Outslope, seed, fertilize. Normal drainage. May treat noxious weeds.	\$2,000-\$3,000
Gate, guardrail, concrete or earth barrier, or Recontour at intersection	Drain dips, drivable waterbars, or outslope. Scarify 2-3 inches, seed & fertilize. May scatter slash on roadway. May treat noxious weeds.	\$2,500-\$4,000

¹ Costs do not include gates, guardrails, and concrete barriers. Cost do not include weed treatment. Costs include minor structure removal when defined under mitigation.

Closure Device	Mitigation	Cost Range ¹ (\$/MILE)
Recontour at intersection or rock or earth barrier	Waterbar or intermittent outslope. Remove CMP's & restore all watercourses to natural channels & floodplains. Rip 6-12 inches, seed and fertilize. May scatter slash on road. May treat noxious weeds.	\$4,000-\$5,000
Recontour at intersection or Rock or earth barrier	Waterbar or intermittent outslope. Selective recontour along the road. Remove CMP's & restore all watercourses to natural channels & floodplains. Rip 12-18 inches, seed & fertilize. Scatter slash on recontoured slope. May treat noxious weeds.	\$4,000-\$7,500
Recontour	Recontour the entire road prism to almost pre-road conditions. Remove CMP's & restore all watercourses to natural channels & floodplains. Seed & fertilize. Scatter slash on recontoured slope. May treat noxious weeds.	\$7,500 and up

SECTION 212. - LINEAR GRADING

(Labor 45 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.

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 on the following pages is appropriate and fits the intent of the specification. The tables consider each of the typical sections commonly used in the Region. The assumptions listed below were used in preparing the tables:

Assumptions used for Table 38, Table 39, and Table 40

- Clearing limits are from the top of cut plus 5 feet and to toe of fill plus 5 feet. The minimum width is 22 feet.
- There are different tables for cut slopes of $\frac{3}{4}$:1 and cut slopes of 1:1. All fill slopes are $1\frac{1}{2}$:1.
- There is a cost allowance for the logging of the R/W timber on Timber Sales in the timber sale appraisal, therefore they should not be included in the Specified Road Costs. The logging cost of R/W timber as a road cost factor is appropriate for Engineer's Estimates (Public Works projects). Therefore there are differing values depending upon the disposition of the R/W timber.
- The columns for Specified Road Costs allow for the extra cost for decking the R/W timber. This is an additional cost for unit timber.

- The columns for Engineers Estimates include an allowance for the logging and decking of the R/W timber by the contractor to be sold by the Forest Service. See Section 201. - CLEARING AND GRUBBING for topographic factors

Assumptions used for Table 41 and Table 42

- Self-balancing sections
- Compaction factor used (0.25 to 0.75).
- No allowance for drainage features, shaping and finishing, slough widening, curve widening, turnouts, turnarounds, or haul. An additional allowance should be made for these items.

Assumptions used for Tables 40 and 41

- Seeding cost considers cut slopes plus 5 feet and fill slopes plus 5 feet but not the roadbed.

Procedure

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

Step 1 Determine base Clearing and Grubbing Costs in dollars per mile by entering known values for side slopes and right-of-way volume per acre.

Step 1a Adjust the clearing cost by multiplying the base clearing and grubbing cost by the slash disposal adjustment and the widening factors.

- For Slash Disposal refer to Section 201. - CLEARING AND GRUBBING
 - Table 18. Adjustment Factor for Slash Treatment Method and
 - Table 19. Adjustment Factor for Slash Treatment of Tops & Limbs, Logs, and Stumps.
- For additional clearing width due to widening apply the factors show in Table 35.
Adjustment Factor for Additional Clearing Width

Table 35. Adjustment Factor for Additional Clearing Width

Method	Factor
No additional widening	1.0
Slough widening, turnouts, curve widening, turnarounds	1.2

Step 2 Add allowance for Individual Removal of Trees refer to section in Section 202. - ADDITIONAL CLEARING AND GRUBBING. Include this in the Engineer's Estimate but not in the Specified Road Cost if the trees are merchantable.

Step 3 Determine base excavation costs in dollars per mile using Table 41. Idaho Excavation \$/Mile for Linear Grading or Table 42. Montana Excavation \$/Mile for Linear Grading with known values for back slopes and side slopes.

Step 3a Adjust the excavation cost for materials and additional widening by multiplying the base excavation cost by the respective adjustment factors. Add additional cost for drainage features, shaping and finishing, or haul as necessary. Refer to Section 204. - EXCAVATION AND EMBANKMENT for these additional costs.

- For material adjustment factor refer to Section 204. - EXCAVATION AND EMBANKMENT
 - Table 21. Material Adjustment Factor
- For additional excavation width due to widening apply the factors show in Table 36. Adjustment Factor for Additional Excavation Width

Table 36. Adjustment Factor for Additional Excavation Width

Method	Factor
No additional widening	1.0
Slough widening, turnouts, curve widening, turnarounds	1.15

Step 4 Determine seeding cost in dollars per mile by using Table 43. Idaho Seeding \$/Mile for Linear Grading or Table 44. Montana Seeding² \$/Mile for Linear Grading

Step 5 Total the results in steps 1 - 4 to determine unit cost.

Linear Grading Calculation Example

Given: 14 FT w/o ditch, ¾:1 back slope, self-balanced sections, no through fills or free haul.

Excavation: 85 percent common; 15 percent rippable rock

Length: 1.7 miles

Average side slope: 30 percent

R/W timber classification: Light-Med 30 CCF/Acre

Windrow construction slash

Hazard Trees: 12 (Total), all merchantable

Turnouts every 1,000 feet

Normal curve widening

One turnaround per mile

Four drainage dips.

Seed, dry method, without mulch.

Find: \$/Mile Location: Montana Zone 2

Step 1 Base Clearing Cost from Table 38. Montana Clearing & Grubbing \$/Mile with Back Slope 3/4:1 for Linear Grading

Engineers Estimate: \$9,440/Mile

Specified Road Cost: \$8,830/Mile

Step 1a Adjustment Factors

- Slash Disposal Factor = 1.0

- Widening Factor = 1.2

Engineers Estimate: $\$9,460/\text{Mile} \times 1.0 \times 1.2 = \$11,352/\text{Mile}$

Specified Road Cost: $\$8,830/\text{Mile} \times 1.0 \times 1.2 = \$10,596/\text{Mile}$

Step 2 Allowance for Individual Removal of Trees \$30/tree.

Engineers Estimate: $(12 \text{ trees} \times \$30/\text{tree}) \div 1.7 \text{ Miles} = \$212/\text{Mile}$

Specified Road Cost: $\$0/\text{Mile}$ (Cost allowance is in the Timber Sale Appraisal)

Step 3 Base excavation cost from Table 42. Montana Excavation \$/Mile for Linear Grading

Excavation Cost: $\$5,433/\text{Mile}$

Step 3a Adjusted excavation cost:

- Material Factor (85 % common; 15% rippable rock):

$$(0.85 \times 1.0) + (0.15 \times 3.0) = 1.3$$

- Topography Factor: 1.0

- Curve Widening Factor: 1.15

Excavation Cost: $\$5,433/\text{Mile} \times 1.3 \times 1.0 \times 1.15 = \$8,534/\text{Mile}$

Drain Dips: $(4 \times \$175/\text{ea}) \div 1.7 \text{ Miles} = \$412/\text{Mile}$

Step 4 Seeding Cost from Table 44. Montana Seeding² \$/Mile for Linear Grading

Seeding Cost: $\$1,200/\text{Mile}$

Step 5 Total Unit Cost

Engineers Estimate: $\$11,352 + \$212 + \$8,534 + \$1,200 = \$21,298/\text{Mile}$

Specified Road Cost: $\$10,596 + \$0 + \$8,534 + \$1,200 = \$20,330/\text{Mile}$

- Adjust for Zone 2 (labor, 45%)

Engineers Estimate: $\$21,298/\text{Mile} \times 0.99 = \$21,085/\text{Mile}$

Specified Road Cost: $\$20,330/\text{Mile} \times 0.99 = \$20,127/\text{Mile}$

- Adjust Specified Road Cost for wood's rates

Specified Road Cost: $\$20,127.1 \div 1.19 = \$16,913/\text{Mile}$

Table 37. Idaho Clearing & Grubbing \$/Mile with Back Slope 3/4:1 for Linear Grading

Side Slope (%)	Vol/Acre (CCF)	Specified Road Cost 12 FT w/o Ditch	Specified Road Cost 14 FT w/o Ditch	Specified Road Cost 12 FT w/ Ditch	Engineers Estimate 12 FT w/o Ditch	Engineers Estimate 14 FT w/o Ditch	Engineers Estimate 12 FT w/ Ditch
0	0	\$5,470	\$5,970	\$6,460	\$5,470	\$5,970	\$6,460
10	0	\$5,970	\$6,460	\$7,220	\$5,970	\$6,460	\$7,220
20	0	\$6,700	\$7,220	\$7,710	\$6,700	\$7,220	\$7,710
30	0	\$7,710	\$8,200	\$8,940	\$7,710	\$8,200	\$8,940
40	0	\$9,180	\$9,700	\$10,680	\$9,180	\$9,700	\$10,680
50	0	\$11,440	\$12,670	\$12,920	\$11,440	\$12,670	\$12,920
0	10	\$5,520	\$6,020	\$6,510	\$5,730	\$6,230	\$6,720
10	10	\$6,020	\$6,510	\$7,270	\$6,230	\$6,720	\$7,480
20	10	\$6,750	\$7,270	\$7,760	\$6,960	\$7,480	\$7,970
30	10	\$7,760	\$8,250	\$8,990	\$7,970	\$8,460	\$9,200
40	10	\$9,230	\$9,750	\$10,730	\$9,440	\$9,960	\$10,940
50	10	\$11,490	\$12,720	\$12,970	\$11,700	\$12,930	\$13,180
0	20	\$5,570	\$6,070	\$6,560	\$5,990	\$6,490	\$6,980
10	20	\$6,070	\$6,560	\$7,320	\$6,490	\$6,980	\$7,740
20	20	\$6,800	\$7,320	\$7,810	\$7,220	\$7,740	\$8,230
30	20	\$7,810	\$8,300	\$9,040	\$8,230	\$8,720	\$9,460
40	20	\$9,280	\$9,800	\$10,780	\$9,700	\$10,220	\$11,200
50	20	\$11,540	\$12,770	\$13,020	\$11,960	\$13,190	\$13,440
0	30	\$5,620	\$6,120	\$6,610	\$6,250	\$6,750	\$7,240
10	30	\$6,120	\$6,610	\$7,370	\$6,750	\$7,240	\$8,000
20	30	\$6,850	\$7,370	\$7,860	\$7,480	\$8,000	\$8,490
30	30	\$7,860	\$8,350	\$9,090	\$8,490	\$8,980	\$9,720
40	30	\$9,330	\$9,850	\$10,830	\$9,960	\$10,480	\$11,460
50	30	\$11,590	\$12,820	\$13,070	\$12,220	\$13,450	\$13,700
0	40	\$5,670	\$6,170	\$6,660	\$6,510	\$7,010	\$7,500
10	40	\$6,170	\$6,660	\$7,420	\$7,010	\$7,500	\$8,260
20	40	\$6,900	\$7,420	\$7,910	\$7,740	\$8,260	\$8,750
30	40	\$7,910	\$8,400	\$9,140	\$8,750	\$9,240	\$9,980
40	40	\$9,380	\$9,900	\$10,880	\$10,220	\$10,740	\$11,720
50	40	\$11,640	\$12,870	\$13,120	\$12,480	\$13,710	\$13,960
0	50	\$5,720	\$6,220	\$6,710	\$6,770	\$7,270	\$7,760
10	50	\$6,220	\$6,710	\$7,470	\$7,270	\$7,760	\$8,520
20	50	\$6,950	\$7,470	\$7,960	\$8,000	\$8,520	\$9,010
30	50	\$7,960	\$8,450	\$9,190	\$9,010	\$9,500	\$10,240
40	50	\$9,430	\$9,950	\$10,930	\$10,480	\$11,000	\$11,980
50	50	\$11,690	\$12,920	\$13,170	\$12,740	\$13,970	\$14,220
0	60	\$5,770	\$6,270	\$6,760	\$7,030	\$7,530	\$8,020
10	60	\$6,270	\$6,760	\$7,520	\$7,530	\$8,020	\$8,780
20	60	\$7,000	\$7,520	\$8,010	\$8,260	\$8,780	\$9,270
30	60	\$8,010	\$8,500	\$9,240	\$9,270	\$9,760	\$10,500
40	60	\$9,480	\$10,000	\$10,980	\$10,740	\$11,260	\$12,240

Side Slope (%)	Vol/Acre (CCF)	Specified Road Cost 12 FT w/o Ditch	Specified Road Cost 14 FT w/o Ditch	Specified Road Cost 12 FT w/ Ditch	Engineers Estimate 12 FT w/o Ditch	Engineers Estimate 14 FT w/o Ditch	Engineers Estimate 12 FT w/ Ditch
50	60	\$11,740	\$12,970	\$13,220	\$13,000	\$14,230	\$14,480
0	70	\$5,820	\$6,320	\$6,810	\$7,290	\$7,790	\$8,280
10	70	\$6,320	\$6,810	\$7,570	\$7,790	\$8,280	\$9,040
20	70	\$7,050	\$7,570	\$8,060	\$8,520	\$9,040	\$9,530
30	70	\$8,060	\$8,550	\$9,290	\$9,530	\$10,020	\$10,760
40	70	\$9,530	\$10,050	\$11,030	\$11,000	\$11,520	\$12,500
50	70	\$11,790	\$13,020	\$13,270	\$13,260	\$14,490	\$14,740
0	80	\$5,870	\$6,370	\$6,860	\$7,550	\$8,050	\$8,540
10	80	\$6,370	\$6,860	\$7,620	\$8,050	\$8,540	\$9,300
20	80	\$7,100	\$7,620	\$8,110	\$8,780	\$9,300	\$9,790
30	80	\$8,110	\$8,600	\$9,340	\$9,790	\$10,280	\$11,020
40	80	\$9,580	\$10,100	\$11,080	\$11,260	\$11,780	\$12,760
50	80	\$11,840	\$13,070	\$13,320	\$13,520	\$14,750	\$15,000
0	90	\$5,920	\$6,420	\$6,910	\$7,810	\$8,310	\$8,800
10	90	\$6,420	\$6,910	\$7,670	\$8,310	\$8,800	\$9,560
20	90	\$7,150	\$7,670	\$8,160	\$9,040	\$9,560	\$10,050
30	90	\$8,160	\$8,650	\$9,390	\$10,050	\$10,540	\$11,280
40	90	\$9,630	\$10,150	\$11,130	\$11,520	\$12,040	\$13,020
50	90	\$11,890	\$13,120	\$13,370	\$13,780	\$15,010	\$15,260
0	100	\$5,970	\$6,470	\$6,960	\$8,070	\$8,570	\$9,060
10	100	\$6,470	\$6,960	\$7,720	\$8,570	\$9,060	\$9,820
20	100	\$7,200	\$7,720	\$8,210	\$9,300	\$9,820	\$10,310
30	100	\$8,210	\$8,700	\$9,440	\$10,310	\$10,800	\$11,540
40	100	\$9,680	\$10,200	\$11,180	\$11,780	\$12,300	\$13,280
50	100	\$11,940	\$13,170	\$13,420	\$14,040	\$15,270	\$15,520

Table 38. Montana Clearing & Grubbing \$/Mile with Back Slope 3/4:1 for Linear Grading

Side Slope (%)	Vol/Acre (CCF)	Specified Road Cost 12 FT w/o Ditch	Specified Road Cost 14 FT w/o Ditch	Specified Road Cost 12 FT w/ Ditch	Engineers Estimate 12 FT w/o Ditch	Engineers Estimate 14 FT w/o Ditch	Engineers Estimate 12 FT w/ Ditch
0	0	\$5,790	\$6,310	\$6,840	\$5,790	\$6,310	\$6,840
10	0	\$6,310	\$6,840	\$7,640	\$6,310	\$6,840	\$7,640
20	0	\$7,100	\$7,640	\$8,160	\$7,100	\$7,640	\$8,160
30	0	\$8,160	\$8,680	\$9,460	\$8,160	\$8,680	\$9,460
40	0	\$9,720	\$10,260	\$11,310	\$9,720	\$10,260	\$11,310
50	0	\$12,110	\$13,410	\$13,670	\$12,110	\$13,410	\$13,670
0	10	\$5,840	\$6,360	\$6,890	\$6,050	\$6,570	\$7,100
10	10	\$6,360	\$6,890	\$7,690	\$6,570	\$7,100	\$7,900
20	10	\$7,150	\$7,690	\$8,210	\$7,360	\$7,900	\$8,420
30	10	\$8,210	\$8,730	\$9,510	\$8,420	\$8,940	\$9,720
40	10	\$9,770	\$10,310	\$11,360	\$9,980	\$10,520	\$11,570
50	10	\$12,160	\$13,460	\$13,720	\$12,370	\$13,670	\$13,930

Side Slope (%)	Vol/Acre (CCF)	Specified Road Cost 12 FT w/o Ditch	Specified Road Cost 14 FT w/o Ditch	Specified Road Cost 12 FT w/ Ditch	Engineers Estimate 12 FT w/o Ditch	Engineers Estimate 14 FT w/o Ditch	Engineers Estimate 12 FT w/ Ditch
0	20	\$5,890	\$6,410	\$6,940	\$6,310	\$6,830	\$7,360
10	20	\$6,410	\$6,940	\$7,740	\$6,830	\$7,360	\$8,160
20	20	\$7,200	\$7,740	\$8,260	\$7,620	\$8,160	\$8,680
30	20	\$8,260	\$8,780	\$9,560	\$8,680	\$9,200	\$9,980
40	20	\$9,820	\$10,360	\$11,410	\$10,240	\$10,780	\$11,830
50	20	\$12,210	\$13,510	\$13,770	\$12,630	\$13,930	\$14,190
0	30	\$5,940	\$6,460	\$6,990	\$6,570	\$7,090	\$7,620
10	30	\$6,460	\$6,990	\$7,790	\$7,090	\$7,620	\$8,420
20	30	\$7,250	\$7,790	\$8,310	\$7,880	\$8,420	\$8,940
30	30	\$8,310	\$8,830	\$9,610	\$8,940	\$9,460	\$10,240
40	30	\$9,870	\$10,410	\$11,460	\$10,500	\$11,040	\$12,090
50	30	\$12,260	\$13,560	\$13,820	\$12,890	\$14,190	\$14,450
0	40	\$5,990	\$6,510	\$7,040	\$6,830	\$7,350	\$7,880
10	40	\$6,510	\$7,040	\$7,840	\$7,350	\$7,880	\$8,680
20	40	\$7,300	\$7,840	\$8,360	\$8,140	\$8,680	\$9,200
30	40	\$8,360	\$8,880	\$9,660	\$9,200	\$9,720	\$10,500
40	40	\$9,920	\$10,460	\$11,510	\$10,760	\$11,300	\$12,350
50	40	\$12,310	\$13,610	\$13,870	\$13,150	\$14,450	\$14,710
0	50	\$6,040	\$6,560	\$7,090	\$7,090	\$7,610	\$8,140
10	50	\$6,560	\$7,090	\$7,890	\$7,610	\$8,140	\$8,940
20	50	\$7,350	\$7,890	\$8,410	\$8,400	\$8,940	\$9,460
30	50	\$8,410	\$8,930	\$9,710	\$9,460	\$9,980	\$10,760
40	50	\$9,970	\$10,510	\$11,560	\$11,020	\$11,560	\$12,610
50	50	\$12,360	\$13,660	\$13,920	\$13,410	\$14,710	\$14,970
0	60	\$6,090	\$6,610	\$7,140	\$7,350	\$7,870	\$8,400
10	60	\$6,610	\$7,140	\$7,940	\$7,870	\$8,400	\$9,200
20	60	\$7,400	\$7,940	\$8,460	\$8,660	\$9,200	\$9,720
30	60	\$8,460	\$8,980	\$9,760	\$9,720	\$10,240	\$11,020
40	60	\$10,020	\$10,560	\$11,610	\$11,280	\$11,820	\$12,870
50	60	\$12,410	\$13,710	\$13,970	\$13,670	\$14,970	\$15,230
0	70	\$6,140	\$6,660	\$7,190	\$7,610	\$8,130	\$8,660
10	70	\$6,660	\$7,190	\$7,990	\$8,130	\$8,660	\$9,460
20	70	\$7,450	\$7,990	\$8,510	\$8,920	\$9,460	\$9,980
30	70	\$8,510	\$9,030	\$9,810	\$9,980	\$10,500	\$11,280
40	70	\$10,070	\$10,610	\$11,660	\$11,540	\$12,080	\$13,130
50	70	\$12,460	\$13,760	\$14,020	\$13,930	\$15,230	\$15,490
0	80	\$6,190	\$6,710	\$7,240	\$7,870	\$8,390	\$8,920
10	80	\$6,710	\$7,240	\$8,040	\$8,390	\$8,920	\$9,720
20	80	\$7,500	\$8,040	\$8,560	\$9,180	\$9,720	\$10,240
30	80	\$8,560	\$9,080	\$9,860	\$10,240	\$10,760	\$11,540
40	80	\$10,120	\$10,660	\$11,710	\$11,800	\$12,340	\$13,390
50	80	\$12,510	\$13,810	\$14,070	\$14,190	\$15,490	\$15,750

Side Slope (%)	Vol/Acre (CCF)	Specified Road Cost 12 FT w/o Ditch	Specified Road Cost 14 FT w/o Ditch	Specified Road Cost 12 FT w/ Ditch	Engineers Estimate 12 FT w/o Ditch	Engineers Estimate 14 FT w/o Ditch	Engineers Estimate 12 FT w/ Ditch
0	90	\$6,240	\$6,760	\$7,290	\$8,130	\$8,650	\$9,180
10	90	\$6,760	\$7,290	\$8,090	\$8,650	\$9,180	\$9,980
20	90	\$7,550	\$8,090	\$8,610	\$9,440	\$9,980	\$10,500
30	90	\$8,610	\$9,130	\$9,910	\$10,500	\$11,020	\$11,800
40	90	\$10,170	\$10,710	\$11,760	\$12,060	\$12,600	\$13,650
50	90	\$12,560	\$13,860	\$14,120	\$14,450	\$15,750	\$16,010
0	100	\$6,290	\$6,810	\$7,340	\$8,390	\$8,910	\$9,440
10	100	\$6,810	\$7,340	\$8,140	\$8,910	\$9,440	\$10,240
20	100	\$7,600	\$8,140	\$8,660	\$9,700	\$10,240	\$10,760
30	100	\$8,660	\$9,180	\$9,960	\$10,760	\$11,280	\$12,060
40	100	\$10,220	\$10,760	\$11,810	\$12,320	\$12,860	\$13,910
50	100	\$12,610	\$13,910	\$14,170	\$14,710	\$16,010	\$16,270

Table 39. Idaho Clearing and Grubbing Cost per Mile with Back Slope 1:1 for Linear Grading

Side Slope (%)	Vol/Acre (CCF)	Specified Road Cost 12 FT w/o Ditch	Specified Road Cost 14 FT w/o Ditch	Specified Road Cost 12 FT w/ Ditch	Engineers Estimate 12 FT w/o Ditch	Engineers Estimate 14 FT w/o Ditch	Engineers Estimate 12 FT w/ Ditch
0	0	\$5,470	\$5,970	\$6,460	\$5,470	\$5,970	\$6,460
10	0	\$5,970	\$6,460	\$7,220	\$5,970	\$6,460	\$7,220
20	0	\$6,700	\$7,460	\$7,950	\$6,700	\$7,460	\$7,950
30	0	\$7,950	\$8,450	\$9,180	\$7,950	\$8,450	\$9,180
40	0	\$9,450	\$10,430	\$11,170	\$9,450	\$10,430	\$11,170
50	0	\$12,420	\$13,670	\$14,410	\$12,420	\$13,670	\$14,410
0	10	\$5,520	\$6,020	\$6,510	\$5,730	\$6,230	\$6,720
10	10	\$6,020	\$6,510	\$7,270	\$6,230	\$6,720	\$7,480
20	10	\$6,750	\$7,510	\$8,000	\$6,960	\$7,720	\$8,210
30	10	\$8,000	\$8,500	\$9,230	\$8,210	\$8,710	\$9,440
40	10	\$9,500	\$10,480	\$11,220	\$9,710	\$10,690	\$11,430
50	10	\$12,470	\$13,720	\$14,460	\$12,680	\$13,930	\$14,670
0	20	\$5,570	\$6,070	\$6,560	\$5,990	\$6,490	\$6,980
10	20	\$6,070	\$6,560	\$7,320	\$6,490	\$6,980	\$7,740
20	20	\$6,800	\$7,560	\$8,050	\$7,220	\$7,980	\$8,470
30	20	\$8,050	\$8,550	\$9,280	\$8,470	\$8,970	\$9,700
40	20	\$9,550	\$10,530	\$11,270	\$9,970	\$10,950	\$11,690
50	20	\$12,520	\$13,770	\$14,510	\$12,940	\$14,190	\$14,930
0	30	\$5,620	\$6,120	\$6,610	\$6,250	\$6,750	\$7,240
10	30	\$6,120	\$6,610	\$7,370	\$6,750	\$7,240	\$8,000
20	30	\$6,850	\$7,610	\$8,100	\$7,480	\$8,240	\$8,730
30	30	\$8,100	\$8,600	\$9,330	\$8,730	\$9,230	\$9,960
40	30	\$9,600	\$10,580	\$11,320	\$10,230	\$11,210	\$11,950
50	30	\$12,570	\$13,820	\$14,560	\$13,200	\$14,450	\$15,190

Side Slope (%)	Vol/Acre (CCF)	Specified Road Cost 12 FT w/o Ditch	Specified Road Cost 14 FT w/o Ditch	Specified Road Cost 12 FT w/ Ditch	Engineers Estimate 12 FT w/o Ditch	Engineers Estimate 14 FT w/o Ditch	Engineers Estimate 12 FT w/ Ditch
0	40	\$5,670	\$6,170	\$6,660	\$6,510	\$7,010	\$7,500
10	40	\$6,170	\$6,660	\$7,420	\$7,010	\$7,500	\$8,260
20	40	\$6,900	\$7,660	\$8,150	\$7,740	\$8,500	\$8,990
30	40	\$8,150	\$8,650	\$9,380	\$8,990	\$9,490	\$10,220
40	40	\$9,650	\$10,630	\$11,370	\$10,490	\$11,470	\$12,210
50	40	\$12,620	\$13,870	\$14,610	\$13,460	\$14,710	\$15,450
0	50	\$5,720	\$6,220	\$6,710	\$6,770	\$7,270	\$7,760
10	50	\$6,220	\$6,710	\$7,470	\$7,270	\$7,760	\$8,520
20	50	\$6,950	\$7,710	\$8,200	\$8,000	\$8,760	\$9,250
30	50	\$8,200	\$8,700	\$9,430	\$9,250	\$9,750	\$10,480
40	50	\$9,700	\$10,680	\$11,420	\$10,750	\$11,730	\$12,470
50	50	\$12,670	\$13,920	\$14,660	\$13,720	\$14,970	\$15,710
0	60	\$5,770	\$6,270	\$6,760	\$7,030	\$7,530	\$8,020
10	60	\$6,270	\$6,760	\$7,520	\$7,530	\$8,020	\$8,780
20	60	\$7,000	\$7,760	\$8,250	\$8,260	\$9,020	\$9,510
30	60	\$8,250	\$8,750	\$9,480	\$9,510	\$10,010	\$10,740
40	60	\$9,750	\$10,730	\$11,470	\$11,010	\$11,990	\$12,730
50	60	\$12,720	\$13,970	\$14,710	\$13,980	\$15,230	\$15,970
0	70	\$5,820	\$6,320	\$6,810	\$7,290	\$7,790	\$8,280
10	70	\$6,320	\$6,810	\$7,570	\$7,790	\$8,280	\$9,040
20	70	\$7,050	\$7,810	\$8,300	\$8,520	\$9,280	\$9,770
30	70	\$8,300	\$8,800	\$9,530	\$9,770	\$10,270	\$11,000
40	70	\$9,800	\$10,780	\$11,520	\$11,270	\$12,250	\$12,990
50	70	\$12,770	\$14,020	\$14,760	\$14,240	\$15,490	\$16,230
0	80	\$5,870	\$6,370	\$6,860	\$7,550	\$8,050	\$8,540
10	80	\$6,370	\$6,860	\$7,620	\$8,050	\$8,540	\$9,300
20	80	\$7,100	\$7,860	\$8,350	\$8,780	\$9,540	\$10,030
30	80	\$8,350	\$8,850	\$9,580	\$10,030	\$10,530	\$11,260
40	80	\$9,850	\$10,830	\$11,570	\$11,530	\$12,510	\$13,250
50	80	\$12,820	\$14,070	\$14,810	\$14,500	\$15,750	\$16,490
0	90	\$5,920	\$6,420	\$6,910	\$7,810	\$8,310	\$8,800
10	90	\$6,420	\$6,910	\$7,670	\$8,310	\$8,800	\$9,560
20	90	\$7,150	\$7,910	\$8,400	\$9,040	\$9,800	\$10,290
30	90	\$8,400	\$8,900	\$9,630	\$10,290	\$10,790	\$11,520
40	90	\$9,900	\$10,880	\$11,620	\$11,790	\$12,770	\$13,510
50	90	\$12,870	\$14,120	\$14,860	\$14,760	\$16,010	\$16,750
0	100	\$5,970	\$6,470	\$6,960	\$8,070	\$8,570	\$9,060
10	100	\$6,470	\$6,960	\$7,720	\$8,570	\$9,060	\$9,820
20	100	\$7,200	\$7,960	\$8,450	\$9,300	\$10,060	\$10,550
30	100	\$8,450	\$8,950	\$9,680	\$10,550	\$11,050	\$11,780
40	100	\$9,950	\$10,930	\$11,670	\$12,050	\$13,030	\$13,770
50	100	\$12,920	\$14,170	\$14,910	\$15,020	\$16,270	\$17,010

Table 40. Montana Clearing and Grubbing Cost per Mile with Back Slope 1:1 for Linear Grading

Side Slope (%)	Vol/Acre (CCF)	Specified Road Cost 12 FT w/o Ditch	Specified Road Cost 14 FT w/o Ditch	Specified Road Cost 12 FT w/ Ditch	Engineers Estimate 12 FT w/o Ditch	Engineers Estimate 14 FT w/o Ditch	Engineers Estimate 12 FT w/ Ditch
0	0	\$5,790	\$6,310	\$6,840	\$5,790	\$6,310	\$6,840
10	0	\$6,310	\$6,840	\$7,640	\$6,310	\$6,840	\$7,640
20	0	\$7,100	\$7,900	\$8,420	\$7,100	\$7,900	\$8,420
30	0	\$8,420	\$8,940	\$9,720	\$8,420	\$8,940	\$9,720
40	0	\$10,000	\$11,050	\$11,830	\$10,000	\$11,050	\$11,830
50	0	\$13,150	\$14,470	\$15,260	\$13,150	\$14,470	\$15,260
0	10	\$5,840	\$6,360	\$6,890	\$6,050	\$6,570	\$7,100
10	10	\$6,360	\$6,890	\$7,690	\$6,570	\$7,100	\$7,900
20	10	\$7,150	\$7,690	\$8,210	\$7,360	\$8,160	\$8,680
30	10	\$8,210	\$8,730	\$9,510	\$8,680	\$9,200	\$9,980
40	10	\$9,770	\$10,310	\$11,360	\$10,260	\$11,310	\$12,090
50	10	\$12,160	\$13,460	\$13,720	\$13,410	\$14,730	\$15,520
0	20	\$5,890	\$6,410	\$6,940	\$6,310	\$6,830	\$7,360
10	20	\$6,410	\$6,940	\$7,740	\$6,830	\$7,360	\$8,160
20	20	\$7,200	\$7,740	\$8,260	\$7,620	\$8,420	\$8,940
30	20	\$8,260	\$8,780	\$9,560	\$8,940	\$9,460	\$10,240
40	20	\$9,820	\$10,360	\$11,410	\$10,520	\$11,570	\$12,350
50	20	\$12,210	\$13,510	\$13,770	\$13,670	\$14,990	\$15,780
0	30	\$5,940	\$6,460	\$6,990	\$6,570	\$7,090	\$7,620
10	30	\$6,460	\$6,990	\$7,790	\$7,090	\$7,620	\$8,420
20	30	\$7,250	\$7,790	\$8,310	\$7,880	\$8,680	\$9,200
30	30	\$8,310	\$8,830	\$9,610	\$9,200	\$9,720	\$10,500
40	30	\$9,870	\$10,410	\$11,460	\$10,780	\$11,830	\$12,610
50	30	\$12,260	\$13,560	\$13,820	\$13,930	\$15,250	\$16,040
0	40	\$5,990	\$6,510	\$7,040	\$6,830	\$7,350	\$7,880
10	40	\$6,510	\$7,040	\$7,840	\$7,350	\$7,880	\$8,680
20	40	\$7,300	\$7,840	\$8,360	\$8,140	\$8,940	\$9,460
30	40	\$8,360	\$8,880	\$9,660	\$9,460	\$9,980	\$10,760
40	40	\$9,920	\$10,460	\$11,510	\$11,040	\$12,090	\$12,870
50	40	\$12,310	\$13,610	\$13,870	\$14,190	\$15,510	\$16,300
0	50	\$6,040	\$6,560	\$7,090	\$7,090	\$7,610	\$8,140
10	50	\$6,560	\$7,090	\$7,890	\$7,610	\$8,140	\$8,940
20	50	\$7,350	\$7,890	\$8,410	\$8,400	\$9,200	\$9,720
30	50	\$8,410	\$8,930	\$9,710	\$9,720	\$10,240	\$11,020
40	50	\$9,970	\$10,510	\$11,560	\$11,300	\$12,350	\$13,130
50	50	\$12,360	\$13,660	\$13,920	\$14,450	\$15,770	\$16,560
0	60	\$6,090	\$6,610	\$7,140	\$7,350	\$7,870	\$8,400
10	60	\$6,610	\$7,140	\$7,940	\$7,870	\$8,400	\$9,200
20	60	\$7,400	\$7,940	\$8,460	\$8,660	\$9,460	\$9,980
30	60	\$8,460	\$8,980	\$9,760	\$9,980	\$10,500	\$11,280
40	60	\$10,020	\$10,560	\$11,610	\$11,560	\$12,610	\$13,390

Side Slope (%)	Vol/Acre (CCF)	Specified Road Cost 12 FT w/o Ditch	Specified Road Cost 14 FT w/o Ditch	Specified Road Cost 12 FT w/ Ditch	Engineers Estimate 12 FT w/o Ditch	Engineers Estimate 14 FT w/o Ditch	Engineers Estimate 12 FT w/ Ditch
50	60	\$12,410	\$13,710	\$13,970	\$14,710	\$16,030	\$16,820
0	70	\$6,140	\$6,660	\$7,190	\$7,610	\$8,130	\$8,660
10	70	\$6,660	\$7,190	\$7,990	\$8,130	\$8,660	\$9,460
20	70	\$7,450	\$7,990	\$8,510	\$8,920	\$9,720	\$10,240
30	70	\$8,510	\$9,030	\$9,810	\$10,240	\$10,760	\$11,540
40	70	\$10,070	\$10,610	\$11,660	\$11,820	\$12,870	\$13,650
50	70	\$12,460	\$13,760	\$14,020	\$14,970	\$16,290	\$17,080
0	80	\$6,190	\$6,710	\$7,240	\$7,870	\$8,390	\$8,920
10	80	\$6,710	\$7,240	\$8,040	\$8,390	\$8,920	\$9,720
20	80	\$7,500	\$8,040	\$8,560	\$9,180	\$9,980	\$10,500
30	80	\$8,560	\$9,080	\$9,860	\$10,500	\$11,020	\$11,800
40	80	\$10,120	\$10,660	\$11,710	\$12,080	\$13,130	\$13,910
50	80	\$12,510	\$13,810	\$14,070	\$15,230	\$16,550	\$17,340
0	90	\$6,240	\$6,760	\$7,290	\$8,130	\$8,650	\$9,180
10	90	\$6,760	\$7,290	\$8,090	\$8,650	\$9,180	\$9,980
20	90	\$7,550	\$8,090	\$8,610	\$9,440	\$10,240	\$10,760
30	90	\$8,610	\$9,130	\$9,910	\$10,760	\$11,280	\$12,060
40	90	\$10,170	\$10,710	\$11,760	\$12,340	\$13,390	\$14,170
50	90	\$12,560	\$13,860	\$14,120	\$15,490	\$16,810	\$17,600
0	100	\$6,290	\$6,810	\$7,340	\$8,390	\$8,910	\$9,440
10	100	\$6,810	\$7,340	\$8,140	\$8,910	\$9,440	\$10,240
20	100	\$7,600	\$8,140	\$8,660	\$9,700	\$10,500	\$11,020
30	100	\$8,660	\$9,180	\$9,960	\$11,020	\$11,540	\$12,320
40	100	\$10,220	\$10,760	\$11,810	\$12,600	\$13,650	\$14,430
50	100	\$12,610	\$13,910	\$14,170	\$15,750	\$17,070	\$17,860

Table 41. Idaho Excavation \$/Mile for Linear Grading

Side Slope (%)	Back Slope ¾:1 12 FT w/o Ditch	Back Slope ¾:1 14 FT w/o Ditch	Back Slope ¾:1 12 FT w/ Ditch	Back Slope 1:1 12 FT w/o Ditch	Back Slope 1:1 14 FT w/o Ditch	Back Slope 1:1 12 FT w/ Ditch
0	\$1,011	\$1,409	\$2,080	\$1,035	\$1,455	\$2,155
5	\$1,011	\$1,409	\$2,080	\$1,035	\$1,455	\$2,155
10	\$1,011	\$1,409	\$2,080	\$1,035	\$1,455	\$2,155
15	\$1,367	\$2,364	\$3,371	\$1,407	\$2,485	\$3,574
20	\$1,969	\$3,283	\$4,498	\$2,084	\$3,570	\$4,874
25	\$2,502	\$4,253	\$5,781	\$2,700	\$4,725	\$6,232
30	\$3,137	\$5,129	\$7,704	\$3,509	\$5,804	\$8,437
35	\$3,919	\$6,404	\$9,202	\$4,420	\$7,401	\$10,425
40	\$4,759	\$9,382	\$11,773	\$5,507	\$11,156	\$13,649
45	\$9,574	\$11,043	\$14,646	\$11,351	\$13,323	\$17,717
50	\$11,480	\$13,229	\$18,279	\$13,965	\$15,986	\$23,435

Table 42. Montana Excavation \$/Mile for Linear Grading

Side Slope (%)	Back Slope ¾:1 12 FT w/o Ditch	Back Slope ¾:1 14 FT w/o Ditch	Back Slope ¾:1 12 FT w/ Ditch	Back Slope 1:1 12 FT w/o Ditch	Back Slope 1:1 14 FT w/o Ditch	Back Slope 1:1 12 FT w/ Ditch
0	\$1,070	\$1,493	\$2,204	\$1,097	\$1,541	\$2,283
5	\$1,070	\$1,493	\$2,204	\$1,097	\$1,541	\$2,283
10	\$1,070	\$1,493	\$2,204	\$1,097	\$1,541	\$2,283
15	\$1,448	\$2,504	\$3,570	\$1,491	\$2,632	\$3,786
20	\$2,086	\$3,477	\$4,764	\$2,208	\$3,782	\$5,163
25	\$2,650	\$4,505	\$6,123	\$2,860	\$5,004	\$6,600
30	\$3,323	\$5,433	\$8,160	\$3,717	\$6,148	\$8,936
35	\$4,151	\$6,783	\$9,746	\$4,681	\$7,839	\$11,042
40	\$5,041	\$9,937	\$12,470	\$5,833	\$11,816	\$14,456
45	\$10,140	\$11,696	\$15,512	\$12,023	\$14,111	\$18,766
50	\$12,159	\$14,011	\$19,361	\$14,791	\$16,932	\$24,822

Table 43. Idaho Seeding² \$/Mile for Linear Grading

Side Slope (%)	Back Slope ¾:1 12 FT w/o Ditch	Back Slope ¾:1 14 FT w/o Ditch	Back Slope ¾:1 12 FT w/ Ditch	Back Slope 1:1 12 FT w/o Ditch	Back Slope 1:1 14 FT w/o Ditch	Back Slope 1:1 12 FT w/ Ditch
0	\$520	\$520	\$520	\$520	\$520	\$520
5	\$520	\$520	\$520	\$520	\$520	\$520
10	\$630	\$630	\$630	\$630	\$680	\$680
15	\$780	\$830	\$830	\$780	\$830	\$830
20	\$830	\$890	\$890	\$830	\$890	\$890
25	\$940	\$1,040	\$1,040	\$1,040	\$1,090	\$1,150
30	\$1,090	\$1,150	\$1,150	\$1,150	\$1,150	\$1,200
35	\$1,200	\$1,250	\$1,250	\$1,300	\$1,360	\$1,410
40	\$1,410	\$1,460	\$1,460	\$1,460	\$1,560	\$1,670
45	\$1,460	\$1,670	\$1,820	\$1,560	\$1,820	\$1,930
50	\$1,820	\$1,930	\$2,080	\$1,980	\$2,080	\$2,240

² Seeding cost is not for native seed. If native seed is required, contact supplier for costs and availability. The roadbed is not included in the area to be seeded.

Table 44. Montana Seeding² \$/Mile for Linear Grading

Side Slope (%)	Back Slope ¾:1 12 FT w/o Ditch	Back Slope ¾:1 14 FT w/o Ditch	Back Slope ¾:1 12 FT w/ Ditch	Back Slope 1:1 12 FT w/o Ditch	Back Slope 1:1 14 FT w/o Ditch	Back Slope 1:1 12 FT w/ Ditch
0	\$550	\$550	\$550	\$550	\$550	\$550
5	\$550	\$550	\$550	\$550	\$550	\$550
10	\$650	\$650	\$650	\$650	\$710	\$710
15	\$820	\$870	\$870	\$820	\$870	\$870
20	\$870	\$930	\$930	\$870	\$930	\$930
25	\$980	\$1,090	\$1,090	\$1,090	\$1,150	\$1,200
30	\$1,150	\$1,200	\$1,200	\$1,200	\$1,200	\$1,250
35	\$1,250	\$1,310	\$1,310	\$1,360	\$1,420	\$1,470
40	\$1,470	\$1,530	\$1,530	\$1,530	\$1,640	\$1,750
45	\$1,530	\$1,750	\$1,910	\$1,640	\$1,910	\$2,020
50	\$1,910	\$2,020	\$2,180	\$2,070	\$2,180	\$2,350

PART V. DIVISION 250 SLOPE REINFORCEMENT AND RETAINING WALLS

SECTION 251. - RIPRAP

Hand-Placed Riprap (Labor 45 percent); Dumped Riprap (Labor 30 percent);
Machine-Placed Riprap (Labor 20 percent); Sacked Soil Cement (Labor 60 percent)
Sacked Concrete (Labor 60 percent); Wire-Enclosed Riprap (Labor 75 percent)

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.

- Calculate haul cost using prices listed in Section 204. - EXCAVATION AND EMBANKMENT.
- Development of the pit or source if required should be calculated using time and equipment.
- Royalty charge in private pits obtained from pit owner – refer to Section 301. – UNTREATED AGGREGATE COURSES or Section 314. – STOCKPILED AGGREGATE.
- Drilling and blasting cost of quarries (if required) – refer to Section 301. – UNTREATED AGGREGATE COURSES or Section 314. – STOCKPILED AGGREGATE.
- Access road development, if required - use time, and equipment.
- Geotextile, if used - estimate material prices and pay under Section 207. – EARTHWORK GEOSYNTHETICS.
- When applicable, include an appropriate allowance to this pay item for contractor quality control.

SECTION 253. - GABIONS AND REVET MATTRESSES

This 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 percent labor for this item. When applicable, included an appropriate allowance to this pay item for contractor quality control.

SECTION 255. - MECHANICALLY-STABILIZED EARTH WALLS

(Labor 40 percent)

Each project is unique and may be estimated on material, labor, and equipment basis. A general cost range is \$35 to \$55 per foot of wall face provided that fill material is on site or close by. This cost includes fill placement and compaction. When applicable, include an appropriate allowance in this pay item for contractor quality control.

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. When applicable, included an appropriate allowance in this pay item for contractor quality control.

Types available include:

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

PART VI. DIVISION 300 AGGREGATE AND BASE COURSES

SECTION 301. – UNTREATED AGGREGATE COURSES

Note: If local conditions indicate that aggregate production will be subcontracted, and that aggregate producers will likely pay Construction Wage Rates (Davis-Bacon), no reduction for labor should be made to the basic rock cost. Also, not all contracts require Construction Wage Rates (Davis-Bacon) 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. The procedure and work items should be considered and estimated for all projects where that type of work is involved.

On larger base course 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. Contact Regional Geotechnical Engineering Staff when determining viability of potential source.

Aggregate costs estimates are broken down by:

- Basic Rock Cost
- Load and Apply
- Haul

Basic Rock Cost

(Labor: 45 percent)

The following costs assume a production rate of 150 tons/hour. Material weighs 2,800 to 3,000 lbs./CY loose. Costs shown are in tons and loose cubic yards. Material Grading C (2 inch minus).

- **Move-in/move-out.** 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. Approximate cost for move-in/move-out are listed below for the different type of rock processing equipment.
 - Screened : \$4,000
 - Crushed Pit Rock : \$9,000
 - Crushed Quarry Rock : \$15,000
 - For platform scale add \$2,000 to \$2,500 (includes move-in, set-up, ramps, and certification).
 - If belt scales will be used, make an allowance of \$500-\$1,500 for certification.
- **Pit development.** Estimate pit or quarry development under Section 314. – STOCKPILED AGGREGATE. Cost may be included in basic rock cost or as a separate pay item. Costs should include:

- Clearing, grubbing, and slash cleanup
- Access roads
- Conserving topsoil
- Removal of overburden
- Ground control and traffic control
- Restoration
- Seeding
- **Royalty charge for private pits.** These are highly variable. Contact geotechnical engineer and/or landowner with possible pit development.
- **Drilling and shooting.** Cost varies depending on the hardness of the rock. The lower costs reflect using ANFO (ammonium nitrate with fuel oil) with 7 foot spacing and the higher costs reflect using rock powder or its equivalent with 6x6 spacing.

Table 45. Cost Range for Different Methods of Drilling and Shooting in Idaho and Montana

Method	Idaho Cost Range \$/CY	Idaho Cost Range \$/TON	Montana Cost Range \$/CY	Montana Cost Range \$/TON
Normal drilling and shooting: (includes tractor for moving material)	\$3.24 - \$7.66	\$2.40 - \$5.67	\$3.36 - \$7.86	2.49 - \$5.82
Breaking oversize	\$5.24 - \$9.66	\$3.88 - \$7.15	\$5.36 - \$9.86	\$3.97 - \$7.31

- Ripping.

Table 46. Cost For Ripping In Idaho and Montana

Method	Idaho Cost Range \$/CY	Idaho Cost Range \$/TON	Montana Cost Range \$/CY	Montana Cost Range \$/TON
Ripping	\$1.30	\$0.96	\$1.38	\$1.02

- **Crushing.** For grading other than **Grading C** as defined in FSSS 703.05, the following multipliers should be applied to crushing costs shown below for pit rock or quarry rock.

Table 47. Cost Adjustment Factor for Gradation Other Than Grading C

Grading Designation	Max Size (inches)	Adjustment Factor
A	3	0.95
B	2	0.95
C	2	1.00

Grading Designation	Max Size (inches)	Adjustment Factor
D	1	1.15
E	$\frac{3}{4}$	1.20
F	1 $\frac{1}{2}$	1.10
G	1	1.15
H	$\frac{3}{4}$	1.25
S	1 $\frac{1}{2}$	1.10
T	1	1.15
U	$\frac{3}{4}$	1.25
L	6	0.60
M	6	0.70
N	4	0.65
O	4	0.70
P	3	0.70
Q	3	0.75
R	2	0.75

- **Crushed Pit Rock.** Drilling and shooting and/or ripping generally not required

Table 48. Cost for Crushed Pit Rock in Idaho and Montana

Idaho \$/CY	Idaho \$/TON	Montana \$/CY	Montana \$/TON
\$4.15	\$3.08	\$4.49	\$3.32

- **Crushed Quarry Rock.** Cost includes loading into crusher.

Table 49. Cost for Crushed Quarry Rock in Idaho and Montana

Idaho \$/CY	Idaho \$/TON	Montana \$/CY	Montana \$/TON
\$5.25	\$3.89	\$5.60	\$4.15

- 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 \$5.00 per ton to rock cost for projects over 10,000 tons and \$7.00 per ton for smaller projects.

- **Screening only**

Table 50. Cost for Screening Rock Only in Idaho and Montana

Idaho \$/CY	Idaho \$/TON	Montana \$/CY	Montana \$/TON
\$2.83	\$2.10	\$3.00	\$2.22

- **Pit Run.** No crushing required. Cost includes dozer, loader, and operators.

Table 51. Cost for Pit Run Rock in Idaho and Montana

Idaho \$/CY	Idaho \$/TON	Montana \$/CY	Montana \$/TON
\$2.15	\$1.59	\$2.29	\$1.70

- **Stockpiling.**

Table 52. Cost for Stockpiling Rock in Idaho and Montana

Idaho \$/CY	Idaho \$/TON	Montana \$/CY	Montana \$/TON
\$0.95	\$0.70	\$1.01	\$0.75/

- **Weighing** (Platform Scales) Idaho: \$0.29/ton; Montana:\$0.29/ton
- **Contractor Quality Control.** If required by contract, add the cost of contractor sampling and testing. See Section 153. - CONTRACTOR QUALITY CONTROL

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:

- **On grade process and haul losses:** essentially negligible for conscientious operator.
- **Stockpiling losses:** Approximately 5 percent; use only if stockpiling required by contract, physical arrangement of pit, or work schedule imposed by contract.
- **Crushing/screening/blasting.** Quarry operation approximately 5-10 percent. 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.

Example Basic Rock Calculation

Given: Grading D, compact by hauling equipment.

Quantity required on the road - 10,000 tons

Location: Idaho, Kootenai County

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) \$17,000 - Include under Section 151. - MOBILIZATION.

Answer:

Drill and shoot: $\$5.67/\text{TONs} \times 11,500 \text{ TONs} = \$65,205$

Crushing and screening: $\$3.89/\text{TONs} \times 11,500 \text{ TONs} = \$44,735$

Stockpiling: $\$0.70/\text{TONs} \times 10,500 \text{ TONs} = \$7,350$

Weighing: $\$0.29/\text{TONs} \times 10,000 \text{ TONs} = \$2,900$

Contractor sampling & testing (lump sum): = \$3,000

Total Cost: $\$65,205 + \$44,735 + \$7,350 + \$2,900 + \$3,000 = \$123,190$

Unit Cost for Base Rock: $\$123,190/10,000 \text{ TONs} = \$12.32/\text{TON}$

Adjust for Idaho, Kootenai County, and 45% labor; $\$12.32/\text{TON} \times 1.03 = \$12.69/\text{TON}$

Engineer's Estimate: $\$12.69/\text{TON}$

Specified Road Cost: $\$12.69/\text{TON} \div 1.17 = \$10.85/\text{TON}$

Load and Apply

(Labor = 40 percent)

All costs for loading and applying shall be calculated based on loose volume of rock and converted to in-place quantity for payment.

- **Loading** costs are variable depending on procedures at pit. These vary depending on loading method.

Table 53. Cost per Loose CY and Ton by Loading Method in Idaho and Montana

Loading Method	Idaho \$/CY	Idaho \$/TON	Montana \$/CY	Montana \$/TON
from belt (included in basic rock cost)	\$0	\$0	\$0	\$0
from hopper (included in basic rock cost)	\$0	\$0	\$0	\$0
pit run (included in basic rock cost)	\$0	\$0	\$0	\$0
from stockpile	\$0.95	\$0.70	\$1.02	\$0.76

- **Initial Spreading** (knocking down piles and rough grading if needed)

Table 54. Cost per Loose CY and Ton for Initial Spreading in Idaho and Montana

Idaho \$/CY	Idaho \$/TON	Montana \$/CY	Montana \$/TON
\$0.58	\$0.43	\$0.62	\$0.46

- **Grid rolling.** Cost is approximate.

Table 55. Cost per Loose CY And Ton for Grid Rolling in Idaho and Montana

Idaho \$/CY	Idaho \$/TON	Montana \$/CY	Montana \$/TON
\$0.71	\$0.52	\$0.75	\$0.55

- **Grading** (Blading) of Aggregate Base or Surface Course. Cost is approximate.

Table 56. Cost Per Loose CY and Ton for Grading of Aggregate Base or Surface Course in Idaho and Montana

Idaho \$/CY	Idaho \$/TON	Montana \$/CY	Montana \$/TON
\$0.83	\$0.62	\$0.89	\$0.66

- **Compaction.** Cost is approximate.

Table 57. Cost Per Loose CY and Ton by Compaction Method in Idaho and Montana

Method	Idaho \$/CY	Idaho \$/TON	Montana \$/CY	Montana \$/TON
With hauling equipment	\$0.18	\$0.13	\$0.19	\$0.14
With rollers	\$0.59	\$0.44	\$0.62	\$0.46

- **Watering:** Estimate under Section 158. – WATERING FOR DUST CONTROL; water should be included in the cost estimate of Section 301. – UNTREATED AGGREGATE COURSES, unless Forest has sufficient contract administration personnel for inspection of watering as separate pay item.

Aggregate Haul

(Labor = 30-50 percent)

Estimate haul under Section 204. - EXCAVATION AND EMBANKMENT. These costs are based on loose cubic yards. Use appropriate weight conversion factor to convert to \$/TON-MILE. If measurement for payment or credit is on another basis, appropriate adjustment factors must be made.

If construction induced maintenance is needed, it should be included in aggregate haul costs.

Example Aggregate Haul Calculation

Given: 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 (18 CY)

Density: 1.35 tons per cubic yard

Basis of payment: Ton

Location: Idaho – Rest of Idaho

Labor: 35%

Answer:

$$\text{Haul Cost} = \text{Fixed Cost} + (\text{Variable Haul Cost} \times \text{Haul Distance})$$

See HAUL Section for unit costs

$$\text{Haul Cost} = \$1.48 + (\$0.40 \times 3.0) + (\$0.79 \times 6.0) + (\$1.19 \times 2.5) = \$10.40/\text{TON}$$

Engineer's Estimate:

Adjust for Location (35% Labor)

$$\$10.40 \times 1.0 = \$10.40/\text{TON}$$

Specified Road Cost:

Adjust Engineer's Estimate for Construction Wage rate Differential

$$\$10.40 \div 1.11 = \$9.37/\text{TON}$$

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 under a more appropriate section.

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.

Estimator should watch out for *subgrade boulders* which were originally well covered by native subgrade material, but the covering is now thin or absent.

Removing Slides – Anything that involves haul needs to be estimated under Section 204. - EXCAVATION AND EMBANKMENT.

Pull ditches with grader and clean catch basins **ID** \$365/Mile, **MT** \$390/Mile

Scarifying and shaping

Table 58. A Range of Cost per Mile to Scarify and Shape a Single or Double Lane Road in Idaho and Montana

Road Width	Idaho	Montana
Single Lane	\$1,075 - \$1675	\$1,150 - \$1,775
Double Lane	\$1,425 - \$2,225	\$1,525 - \$2,375

Finish grading with blade

Table 59. Cost per Mile for Finish Grading with Blade in Idaho and Montana

Road Width	Idaho	Montana
Single Lane	\$415	\$445
Double Lane	\$560	\$600

Compaction. Refer to FP14 FSSS 204.00_National_11_4_2016 Subsection 204.11 for compaction methods.

Table 60. Compaction Cost per Mile by Placement Method for Single and Double Lane Road in Idaho and Montana

Compaction Method	Idaho Single Lane	Idaho Double Lane	Montana Single Lane	Montana Double Lane
Placement Method 2	\$330	\$550	\$345	\$575
Placement Method 3	\$225	\$370	\$235	\$395
Placement Method 4	\$150	\$250	\$160	\$270

Water - Estimate under Section 158. – WATERING FOR DUST CONTROL.

Constructing New Ditch - Include under Section 204. - EXCAVATION AND EMBANKMENT

Erosion Control Measures - Include under Section 157. - SOIL EROSION AND SEDIMENT CONTROL

Clearing and Grubbing - Include under Section 201. - CLEARING AND GRUBBING

Asphalt and Aggregate Surfaces - Estimated using Section 204. - EXCAVATION AND EMBANKMENT, Section 301. – UNTREATED AGGREGATE COURSES, Section 403. - ASPHALT CONCRETE, Section 407. – CHIP SEAL, Section 410. - SLURRY SEAL, Section 411. - ASPHALT PRIME COAT, Section 412. - ASPHALT TACK COAT, and Section 414. - ASPHALT PAVEMENT CRACK SEALING AND FILLING.

Contractor Quality Control - When applicable, include an appropriate allowance to this pay item for contractor quality control.

SECTION 312. - DUST PALLATIVE

(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. If product is unavailable locally, recommendations and information are available from the RO Materials Engineering. The following is a summary of essential information.

Application Rates. See Application Rates in Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects, FP-14 Section 312. - DUST PALLATIVE.

Rates for lignin sulfonate and chloride products are based on the solid contents shown in Table 61. Approximate Weight-Volume Factors @ 60°F. 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*.

Table 61. Approximate Weight-Volume Factors @ 60°F

Material	Gallons/Ton	Pounds/Gallon	Average Application Rate
Lignin Sulfonate, 50 percent solids, 1.20 min Specific Gravity	190	10.51	0.4 gal/yd ²
Magnesium Chloride, 30 percent minimum solids, 1.29-1.33 Specific Gravity.	182	10.98	0.5 gal/yd ²
Calcium Chloride Dry, 94 percent minimum solids	171	11.69	1.6 lbs/yd ²
Calcium Chloride Liquid, 38 percent solids Specific Gravity 1.39	173	11.57	0.27 gal/yd ²

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.

Shipping Costs: Shipping costs are variable and should be verified for each project.

Road Preparation: Road preparation costs will depend on the existing surface condition, requirements in other Section 301. – UNTREATED AGGREGATE COURSES or See Section 158. – WATERING FOR DUST CONTROL for watering.

Application Cost: Typical application costs are \$25 to \$85 per M-Gals (\$5 to \$15 per ton) of liquid, depending on the type of distributor. Call distributor for additional information.

SECTION 314. – STOCKPILED AGGREGATE

Development of Pits and Quarries

(Labor percent and reduction as per sections used in estimating)

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

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. - EXCAVATION AND EMBANKMENT. Pay particular attention to materials and terrain encountered in access road construction that will affect cost of construction.

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. - EXCAVATION AND EMBANKMENT.

Turf establishment may be estimated per instructions in Section 625. - TURF ESTABLISHMENT.

Ground and traffic control estimated per requirements in Section 633. - PERMANENT TRAFFIC CONTROL.

Consider making development costs indirect to the items requiring the pit or quarry. Estimator should pay close attention to requirements shown on the pit development plan and 30 CFR part 56.

PART VII. DIVISION 400 ASPHALT PAVEMENTS AND SURFACE TREATMENTS

General: Contractor Quality Control and Testing - All materials and tasks, as applicable, need to be certified and all contractor control and sampling need to be accomplished per Specification FP-14 Section 106 - ACCEPTANCE OF WORK and Section 154. - CONTRACTOR SAMPLING AND TESTING.

SECTION 403. - ASPHALT CONCRETE

(Contract Item)

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. In the absence of local prices, use \$90 to \$120 per TON for estimates of in-place asphalt concrete. If separate estimates for asphalt cement and asphalt pavement are needed, use \$300 to \$450 per TON for asphalt cement and \$70 to \$100 per TON for asphalt concrete.

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 145 pounds per cubic foot for in-place compacted density and 6.0 percent asphalt cement based on weight of total mix.

Lower air voids (3%) and high asphalt content (~6% by weight) are generally better for most low volume roads. It may be helpful to separate asphalt cement and asphalt pavement as separate pay items so that the contractor is fairly compensated for extra asphalt cement.

Increase cost of asphalt if anti-strip additive is required.

SECTION 407. – CHIP SEAL

(Contract Item)

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

- **Crush and Stockpile.** Refer to Section 301. – UNTREATED AGGREGATE COURSES. 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).
- **Loading Aggregate.** Refer to Section 301. – UNTREATED AGGREGATE COURSES.
- **Weighing.** (platform scales) Include cost for scale move-in, set-up and certification (Refer to Section 151. - MOBILIZATION). If bin or belt scales are used, allow \$500-\$1000 for certification. For small projects consider using lump sum or cubic yard measurement.
- **Hauling.** Refer to Section 204. - EXCAVATION AND EMBANKMENT.

- **Road Surface Preparation, Brooming & Other Prep Work.** Estimate the number of passes for power broom. Travel speed of 5-7 miles per hour.
- **Aggregate Application.** Include cost of self-propelled aggregate spreader and truck time while waiting and spreading.
- **Rolling.** Immediately after application of aggregate. Estimate using pneumatic-tired roller (self-propelled).
- **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.
- **Surface Maintenance.** Determine maintenance and brooming during and at the end of the curing period.
- **Temporary Centerline Marking.** Refer to Section 634. - PERMANENT PAVEMENT MARKINGS.

Bituminous Material. Obtain current quotes from local suppliers. Asphalt costs are dependent upon quantity and location.

Refer to the FP-14 specifications for Application Rates for emulsified and liquid asphalts.

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.

Increase cost of asphalt if anti-strip additive is required for cut-back asphalts.

Bituminous Surface Treatments and Seal Coats Using Emulsified Asphalts. Refer to the FP-14 specifications and FSSS for Application Rates for emulsified and liquid asphalts.

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. Coordinate with RO Geotechnical Engineer for assistance.

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.

In absence of local costs, use \$2 to \$5 per square yard.

SEAL FOR LIGHT TRAFFIC PAVEMENTS

Application rates depend on your project conditions and the desired surface. Cost vary contingent on cost of materials, size of project and condition of pavement. Unit prices should be less for projects over 10,000 square yards and higher for smaller irregular shaped areas that are at least partially covered with duff and pine needles.

Contacting local contractors is recommended if an accurate estimate is desired. Contractors are listed in the Yellow Pages under "Asphalt and Asphalt Products", and under "Pave Materials". When discussing your project with them, the following items should be reviewed.

- The specification requires seal material conforming to FP-14 Section 702 - ASPHALT MATERIAL. Proprietary products like Seal Master, Tuff Coat, and PermaSeal have met this spec on past projects. If they are not familiar with the spec, you should FAX them a copy.
- Your project size and payment quantity is expressed in square yards, and not square feet.
- The specification application rates for aggregate are in pounds solids per square yard and for emulsified asphalt and asphalt binder are in gallons per square yard.
- A site visit by a local contractor is preferred, so they can get a better idea of the amount of the crack filling, pavement surface cleanup required, etc.

SECTION 410. - SLURRY SEAL

(Contract Item)

Obtain costs from supplier.

SECTION 411. - ASPHALT PRIME COAT

(Contract Item)

Obtain current quotes from local suppliers. Asphalt costs dependent upon quantity and location.

SECTION 412. - ASPHALT TACK COAT

(Contract Item)

\$1.75 to \$3.00 per square yard. Check with local suppliers. Costs is dependent upon quantity and location. Ensure surface preparation and brooming cost are included in quoted price, if not make allowances for this work. In absence of local costs, estimate.

SECTION 414. - ASPHALT PAVEMENT CRACK SEALING AND FILLING

(Contract Item)

\$2.00 to \$5.00 per lineal foot or \$3.00 to 6.00 per lb. in place. Check with local suppliers.

SECTION 415. - PAVING GEOTEXTILES

(Contract Item)

Obtain costs from local suppliers.

SECTION 418. – ASPHALT CONCRETE PAVEMENT PATCHING

(Contract Item)

\$100 to \$150 per ton in place. Check with local suppliers.

PART VIII. DIVISION 550 BRIDGE CONSTRUCTION

COST ESTIMATING BRIDGE CONSTRUCTION FOR PROGRAMMING

Use the methods and unit costs shown in this section to estimate bridge costs. Cost figures include bridge superstructure and substructure costs, “curbs only” railing system (no approach guardrail), riprap, bridge removal, normal erosion and pollution control work, and nominal approach roadway work (~ 5% to 10% of bridge costs).

Currently, 90% of new or replacement bridges have a spill-thru type configuration (trapezoidal stream channel opening). For spans up to 40 feet, concrete, timber or steel bridges are all competitive alternatives. For spans above 40 feet, concrete and steel are the most competitive alternatives.

For spill thru bridge configurations, the span length (S), can be estimated if the “bankfull” dimension (BF), and height (H) from finish grade to stream bed is known. Span length will be approximately, $S = BF + 5 + (3 \times H)$. If scour potential is low, abutments are typically concrete caps perched above the stream in the approach fill. If scour potential is high, abutments will be piling or deep spread footing founded below the stream bed.

Use the following to estimate bridge costs.

Spans up to 40 feet (\$/LF).

- Single Lane \$3000 to \$3500 per Linear Foot
- Double Lane \$4000 to \$5000 per Linear Foot

Spans greater than 40 feet (\$/LF).

- Single Lane \$3250 to \$3750 per Linear Foot
- Double Lane \$4250 to \$4750 per Linear Foot

Bridge Rail/Guardrail.

Add \$175/LF of bridge for bridge rail and \$30,000 for approach guardrail if needed.

Piling/Deep Spread Footings.

Needed due to high scour potential, add \$40,000 for single lane bridges and \$50,000 for double lane bridges.

A/E Design.

Add 15% for A/E design costs to include site surveys, preliminary report, and final design.

Costs can vary greatly depending on the general approach conditions, BMP work, and stream channel work that might be included. Questions should be directed to the Regional Transportation Structures Group Bridge Engineer.

SECTION 551. - DRIVEN PILES

(Contract Item)

Table 62. Furnished Pile Cost, Drive Cost and Shoe Cost for Driven Piles by type of Pile

Type of Pile	Furnished Pile Cost	Drive Cost	Shoe Cost
Treated Timber	\$35/LF	\$55 – 70/LF	\$150/ea
Steel - HP10x42	\$40/LF	\$55 – 70/LF	\$225/ea
Steel - HP12x53	\$45/LF	\$55 – 70/LF	\$225/ea

When applicable, include an appropriate allowance in this pay item for contractor quality control.

SECTION 552. - STRUCTURAL CONCRETE

(Contract Item)

\$600 to \$1000 per cubic yard - Depending on haul and quantity

When applicable, include an appropriate allowance in this pay item for contractor quality control.

SECTION 553. - PRESTRESSED CONCRETE

(Contract Item)

Multi-Beams (Includes Installation).

- Tri-Deck: \$80/SF
- Bulb Tee – 3' to 4'6": \$80/SF
- Bulb Tee – 5' to 5'6": \$95/SF
- Concrete curb: Add \$90/LF

When applicable, include an appropriate allowance in this pay item for contractor quality control.

SECTION 554. - REINFORCING STEEL

(Contract Item)

- Large jobs \$1.75/lb.
- Small jobs (under 1000 lbs.) \$2.00/lb.

SECTION 555. - STEEL STRUCTURES

(Contract Item)

SECTION 556. - BRIDGE RAILING

(Contract Item)

- Approach Rail: \$ 150/LF
- T101 W-beam rail (TL-3): \$175/LF

- Glue Lam. “curb only” (TL-1): \$115/LF
- Concrete “curb only” (TL-1): \$50/LF

SECTION 557. - TIMBER STRUCTURES

(Contract Item) or (R-I Treated Timber Standards - Labor 45 percent of installation cost only)

Table 63. Timber Structures Material Cost per Thousand Board Foot Measure

Material Description	\$/MBFM
Solid sawn (up to 3 inches thick)	\$1750
Solid sawn (up to 3 inches thick) - Heavy	\$3500
Solid sawn (up to 3 inches thick) - Treatment	add 20%
Glue Laminated	\$3500
Glue Laminated - Treatment	add 35%
Timber Hardware	add 1.5%
Treated Structural Timber (installed)	\$5000
Treated Structural Glu-lam Superstructure (installed)	\$7000
Treated Structural Glu-lam Substructure (installed) (vertical timber wall abutments)	\$8000

When applicable, include an appropriate allowance in this pay item for contractor quality control.

PART IX. DIVISION 600 INCIDENTAL CONSTRUCTION

SECTION 601. - MINOR CONCRETE STRUCTURES

(Labor 40 percent)

Concrete for minor structures (about 30 CY or less). Unit price may vary from \$400 to \$500 per CY, depending upon quantity, distance from concrete source, forming difficulty, etc. When applicable, include an appropriate allowance in this pay item for contractor quality control.

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

SECTION 602. - CULVERTS AND DRAINS

General Information. Average unit costs for metal culverts in this guide may be used without adjustment for projects having culverts in excess of 10,000 pounds total. For quantities less than 10,000 pounds, an additional allowance for material only (not installation costs) should be made using the following factors:

- Up To 5,000 lbs. use a factor of 1.35
- 5,000 - 10,000 lbs. use a factor of 1.25

Quality Control. When applicable, include an appropriate allowance in this pay item for contractor quality control.

Compaction is under Section 209. - STRUCTURE EXCAVATION AND BACKFILL.

Include costs for **all required permits** under Section 151. - MOBILIZATION. Refer to 404 Permitting., Storm Water Permitting., and Montana Stream Protection Act (SPA 124) and 318 Authorization Permits. under LABOR RATES - Page 113 of 121.

Culverts up to 36" in diameter and CMPAs up to 42" x 29":

Costs including *excavation* are included in the table below. Unit cost for culverts installed in existing roads and "after grade" will normally be higher than those for new construction due to the increased amount of excavation. The following culvert prices includes bands and should be used for the condition indicated.

Table 64. Cost per LF to Furnish and Install Culverts up 36" in Diameter by installation type for Idaho and Montana.

Size	New Construction Idaho	"After Grade" & Reconstruction (Shallow Installation) Idaho	New Construction Montana	"After Grade" & Reconstruction (Shallow Installation) Montana
15"	\$29	\$32	\$29	\$32
18"	\$31	\$34	\$32	\$35
24"	\$37	\$40	\$37	\$40
30"	\$47	\$50	\$48	\$51
36"	\$58	\$61	\$59	\$62

Longer lengths or Steep side slopes.

Increase the above costs by a factor of 1.1 to 1.3 to reflect steepness of side slopes.

Adjustment to cost in Table 62 for Compaction Method.

Table 65. Compaction Method Cost Adjustment for installation of Culverts up to 36" in Diameter.

Compaction Method Description - FP14 FSSS 209.10_National_7_17_2017	Labor %	Cost Factor
Backfill density exceeds the density of the surrounding embankment. Do not use on culverts larger than 36" or ACMPs larger than 42" x 29". Compaction Method 4	30%	0.90
Adjust the moisture content of the backfill material to a moisture content suitable for compaction. Compact each layer using appropriate compaction equipment until visual displacement ceases. Compaction Methods 3, 5, and 6	40%-60%	1.00
Determine optimum moisture content and maximum density according to AASHTO T 99-17 method C. Adjust the moisture content of the backfill material to a moisture content suitable for compaction. Compact material placed in all layers to at least 95 percent of the maximum density. Determine the in place density and moisture content according to AASHTO T 310 or other approved test procedures. Compaction Method 2	40%-60%	1.10

Culverts 42" in diameter and larger and CMPAs 49" x 33" and larger:

(Labor: 40-60%)

Estimate larger pipes by time and equipment methods. Following are some items that should be considered under Section 602. - CULVERTS AND DRAINS, Section 208. - STRUCTURE EXCAVATION AND BACKFILL FOR SELECTED MAJOR STRUCTURES and Section 209. - STRUCTURE EXCAVATION AND BACKFILL when estimating installation of larger pipes:

- 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 ellipse, 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. Allow time for diversion of the stream and cost for special materials or equipment needed for diversion such as plastic sheeting, piping, pumps, etc. Check results against bid history.
- 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.

Costs for excavation of culverts larger than 36 inches or the squash equivalent is **not** included in the cost for the culvert under Section 602. - CULVERTS AND DRAINS. The cost for this type of excavation would be estimated under

- Section 208. - STRUCTURE EXCAVATION AND BACKFILL FOR SELECTED MAJOR STRUCTURES.
Bedding material for culvert backfill ranges from \$10 to \$25/CY, actual cost will depend on haul distance, excavation conditions, etc.

Culvert Material Base Price

The following materials and shop prices are provided as a guide for use in estimating culvert prices (based on truck load quantities). Due to the volatility of steel and polyethylene prices, material costs should be checked with local suppliers. Local suppliers' prices and discounts may be substituted, if available.

Polyethylene Corrugated Pipe

Table 66. Cost for 20 Foot Sections of Double Wall Rigid Polyethylene Corrugated Pipe

Size (inches)	Cost/ft	Bands (Couplings)
12	\$7.61	\$12.38
15	\$11.52	\$24.64
18	\$14.10	\$28.21
24	\$24.89	\$32.00
30	\$41.58	\$90.00
36	\$47.13	\$80.00
42 (bell & spigot)	\$61.57	n/a
48 (bell & spigot)	\$79.45	n/a

Corrugated Metal Pipe (CMP)

Table 67. Cost for CMP with 2-2/3 in. x 1/2in. Corrugations and 0.064 (16ga) Thickness.

Size (inches)	\$/ft	lb/ft
12	\$10.54	10
15	\$12.63	12
18	\$15.80	15
24	\$19.84	19
30	\$25.06	24
36	\$30.93	29
42	\$36.26	34
48	\$40.53	38

Table 68. Cost for CMP with 2-2/3 in x 1/2in. Corrugations and 0.079 (14ga) Thickness.

Size (inches)	\$/ft	lb/ft
18	\$18.90	18
24	\$25.20	24
30	\$31.50	30
36	\$37.80	36
42	\$44.10	42
48	\$50.40	48
54	\$56.70	54

Table 69. Cost for CMP with 2-2/3 in. x 1/2in. Corrugations and 0.109 (12ga) Thickness.

Size (inches)	\$/ft	lb/ft
24	\$34.65	33
30	\$43.05	41
36	\$51.45	49
42	\$59.85	57
48	\$68.25	65
54	\$75.60	73
60	\$85.05	81
66	\$93.45	89

Table 70. Cost for CMP with 2-2/3 in. x 1/2in. Corrugations and 0.138 (10ga) Thickness.

Size (inches)	\$/ft	lb/ft
60	\$108.15	103
66	\$118.65	113
72	\$129.15	123

Table 71. Cost for CMP with 3"x1" and 5"x1" Corrugations and 0.064 (16ga) Thickness.

Size (inches)	\$/ft	lb/ft
42	\$40.95	39
48	\$46.20	44
54	\$52.50	50
60	\$57.75	55
66	\$63.00	60
72	\$69.30	66
78	\$74.55	71
84	\$80.85	77

Table 72. Cost for CMP with 3"x1" and 5"x1" Corrugations and 0.079 (14ga) Thickness.

Size (inches)	\$/ft	lb/ft
42	\$49.35	47
48	\$56.70	54
54	\$64.05	61
60	\$70.35	67
66	\$77.70	74
72	\$85.05	81
78	\$91.35	87
84	\$98.70	94
90	\$105.00	100
96	\$112.35	107
102	\$119.70	114
108	\$126.00	120

Table 73. Cost for CMP with 3"x1" and 5"x1" Corrugations and 0.109 (12ga) Thickness.

Size (inches)	\$/ft	lb/ft
54	\$87.15	83
60	\$96.60	92
66	\$106.05	101
72	\$115.50	110
78	\$124.95	119
84	\$134.40	128
90	\$143.85	137
96	\$154.35	147
108	\$173.25	165
120	\$192.15	183

Table 74. Cost for CMP with 3"x1" and 5"x1" Corrugations and 0.138 (10ga) Thickness.

Size (inches)	\$/ft	lb/ft
108	\$221.55	211
120	\$245.70	234
132	\$271.95	259
144	\$296.10	282

Coupling Bands - Equivalent cost.

- Up to and including 72" diameter = 2' of pipe
- Greater than 72" diameter = 3' pipe

Arched pipe.

- More than 100' of one diameter, add 15 percent.
- Between 30 to 100' of one diameter, add 25 percent,
- Less than 30' of one diameter add 40 percent.

Culvert Pipe End Treatment

Does not include material.

Table 75. Cost per Cut for Labor and Equipment to Cut a Skew or Bevel Culvert Pipe End

Diameter or equivalent Span & Rise (inches)	Price per cut (skew or bevel)
18	\$27.00
24	\$36.00
30	\$45.00
36	\$54.00
42	\$63.00
48	\$72.00
54	\$81.00

Diameter or equivalent Span & Rise (inches)	Price per cut (skew or bevel)
60	\$90.00
66	\$99.00
72	\$108.00

Five Percent Shop Ellipse

Same cost additions as for arch pipe. Call for quotes.

Special Coatings

Call culvert distributor for quotes.

End Sections (Flared End Terminal Sections)

Table 76. Cost per EACH End Section for Round Pipe

Diameter of pipe (inches)	Gage	Price (ea.)	Galvanized Weight (lbs.)
12	16	\$88.84	28
15	16	\$112.52	36
18	16	\$151.48	50
24	16	\$220.66	76
30	14	\$443.16	157
36	14	\$673.45	209
42	12	\$1085.91	430
48	12	\$1261.35	509
54	12	\$1492.90	630
60	12/10	\$2008.91	826
72	12/10	\$2424.98	998
84	12/10	\$2945.30	1200

Table 77. Cost per EACH End Sections for Arch Pipe

Dimensions of Arch (inches)	Equivalen t Round (inches)	Gage	Price (ea.)	Galvanized Weight (lbs.)
17x13	15	16	\$121.93	30
21x15	18	16	\$141.87	37
28x20	24	16	\$211.41	60
35x24	30	14	\$354.20	109
42x29	36	14	\$569.07	165
49x33	42	12	\$849.19	276
57x38	48	12	\$862.70	361
64x43	54	12	\$1973.51	520
71x47	60	12/10	\$2407.37	790
77x52	66	12/10	\$3120.09	818
83x57	72	12/10	\$3358.30	887

Timber Cross Drains and Drainage Deflectors

(Labor 30 percent)

Designer and estimator are reminded that extreme caution is warranted for designing and/or use of open-top culverts due to relatively high initial costs and potential maintenance problems.

Open-tops are not recommended for surfaced roads, particularly Level of Service A through H. Use on low-standard roads where nothing else is practical on a short-term basis may be warranted. Costs nearly equal conventional polyethylene or metal culverts including catch basin construction over the long-term.

Drainage deflectors with rubber belting have usually proven to be better than open-tops for diverting water off the road surface on steeper grades. They generally require less maintenance, except on heavily traveled roads where the belting needs replacement on a periodic basis. The in-place cost of these deflectors is about the same as cost per foot of an 18" installed CMP, plus riprap for slope protection if required.

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, include an appropriate allowance in 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.

SECTION 605. - UNDERDRAINS, SHEET DRAINS, AND PAVEMENT EDGE DRAINS

(See items below for labor and reductions)

Underdrains

Perforated pipe \$/LF (Labor 40 percent). Add 15 percent to standard culvert price.

Porous backfill (filter material)

(Labor 10 percent)

Develop cost by using same criteria as used for Section 301. – UNTREATED AGGREGATE COURSES. Haul cost to be estimated from the nearest point of manufacture.

Geotextiles

(Labor 10 percent)

When using geotextiles, the pipe must be placed in open graded 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. – UNTREATED AGGREGATE COURSES (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.

SECTION 606. - CORRUGATED METAL SPILLWAYS

(Labor 20 percent)

Use time, material, and equipment.

Round Pipe

If round pipe is used, 70 percent of the unit price in Section 602. - CULVERTS AND DRAINS will apply, 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 corrugated metal catch basin 12" diameter 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.

Inlet assemblies

Estimated the same as Section 602. - CULVERTS AND DRAINS, End Sections. Inlet assemblies are measured by the number installed and accepted.

Downpipe

Measure the quantity of lineal feet installed including accessories except inlets. Estimates should include gaskets and anchors. An 18" downpipe with all accessories will cost about \$60/LF installed.

Anchors

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, RELAYING, AND REPAIRING EXISTING DRAINAGE STRUCTURES

(Labor 75 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 at the unit price for culvert excavation, or use time and equipment. Removing, cleaning, and relaying of pipe should cost approximately 70 percent of the in place price per foot for new construction for a given size of pipe as listed in Section 602. - CULVERTS AND DRAINS.

SECTION 609. - CURB AND GUTTER

(Labor 40-50 percent)

Use time, materials, and equipment estimate.

SECTION 615. - SIDEWALKS, PADS, AND PAVED MEDIANS

(Labor 40-50 percent)

Use time, materials, and equipment estimate.

SECTION 617. - GUARDRAIL

(Contract Item)

Use approximately \$50 per lineal foot (installed). Cost includes posts on 6'3" centers and regular sections.

Add 20% to unit price for curved rail sections.

Estimate about \$1000 - \$3000 each for end anchorage or terminal sections based on type of system used.

Add 40% for Rustic guardrail.

Call manufacturer for price quotes on material prices.

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.

SECTION 618. - CONCRETE BARRIERS AND PRECAST GUARDWALLS

(Contract Item)

Concrete barriers (Jersey) will cost about \$110 per lineal foot plus installation.

Call manufacturer for price quotes on material prices.

SECTION 619. - FENCES, GATES, CATTLE GUARDS, AND BOLLARD POST

Signs should be estimated under Section 633. - PERMANENT TRAFFIC CONTROL.

Fences

(Labor 60 percent)

Four strand barbed wire - Estimate by time, equipment and material. Costs average about \$4.00/LF.

Gates

(Labor 15 percent metal gates, 65 percent wire gates, 10 percent concrete barriers, 30 percent guardrail barriers).

Check with supplier for current cost and estimate installation using time and equipment based on actual installation site.

- Double Lane Metal Gate - \$3500 - \$5000 EACH.
- Single Lane Metal Gate - \$2500 - \$3500 EACH.
- Concrete Barriers - Estimate by time, equipment and material. Call for quotes.
- Guardrail Barriers - Estimate by time, equipment and material. Call for quotes.

Cattleguards

(Labor 10 percent)

Cost is approximately \$12,000 for **16'-0"** width cattle guard. Price includes wings and base. Check with supplier for current cost and estimate installation using time and equipment based on actual installation site.

Note: Precast concrete base weighs 5,250 pounds/side. Ensure appropriate equipment for hauling and unloading is included.

Table 78. Cost Adjustment Factor for Steel Cattleguard Decked with HS20-44 Loading

Width (Feet)	Adjustment Factor
12	0.90
14	0.95
16	1.00
24	1.50
28	1.75

SECTION 621. - MONUMENTS AND MARKERS

(Labor 25 percent)

Estimate by time, equipment, and material.

SECTION 622. - RENTAL EQUIPMENT

Equipment rental includes the equipment rate and the operator rate. Equipment rates can be found in PART X. EQUIPMENT RATES. Operator rates can be found in PART XI. LABOR RATES. The cost of moving most equipment to the job is included in Section 151. - MOBILIZATION

Ensure a description of the type of anticipated work is include in the contract language.

SECTION 624. - TOPSOIL

(Labor 50 percent)

Topsoil needed on disturbed areas of backslopes and fillslopes 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 Section 204. - EXCAVATION AND EMBANKMENT.
- Clearing and development of pit area – refer to Section 314. – STOCKPILED AGGREGATE.
- Move-in Move out – refer to Section 151. - MOBILIZATION
- Purchase price for topsoil on other than USFS lands.

SECTION 625. - TURF ESTABLISHMENT

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

Note: The costs for seeding are based on applying seed at 25lb/acre and 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.

Dry seeding Method

- Idaho - \$430 per ACRE
- Montana - \$450 per ACRE

Cost of fertilizer, where required, should be included in the base item. Fertilizer should be used only for supplemental applications.

If native grass seed is required, get a quote from a supplier.

Call supplier for quote on hydraulic seeding.

SECTION 629. - ROLLED EROSION CONTROL PRODUCTS AND CELLULAR CONFINEMENT SYSTEMS

Costs for erosion control blankets and netting materials range from \$2 to \$4 per SY. Call supplier for additional quote information.

SECTION 633. - PERMANENT TRAFFIC CONTROL

(Labor 60 percent)

Prices are for estimating only. Call for quotes.

Table 79. Rough Cost Estimate for Different Permanent Traffic Control Materials

Materials	Material Cost
Wood Post	\$1.50 to \$4/LF
Steel u-channel post (2 lbs./ft)	\$5.10/LF
Signs	\$100 to \$200/EACH
Route Markers	\$20 to \$30/ EACH
Aluminum Sign Panels	\$20/SF
Fiberglass Sign Panels	\$20 to \$25/SF
Wood Sign Panels	\$20/SF
Regulatory/Warning Signs	\$170 to \$225/ EACH
Sign and Post(s)	\$125 to \$300/ EACH
Delineators w/ posts	\$15 to \$25/ EACH
Delineator only Double Sided	\$10 EACH

One Sign and Post – Installation Only – \$35-\$60 EACH. Increased the cost of installation if sign posts are to be installed in rocky fills or other situations requiring difficult excavation.

SECTION 634. - PERMANENT PAVEMENT MARKINGS

(Contract Item)

Call local suppliers for current materials cost or local contractors for a project specific estimate.

Costs can be estimated on the basis of the gallons of paint including the glass beads, cleaning surface to be painted, application, and protection of markings until dry. Typical amounts are 16.5 gallons of paint (including beads) per mile of broken stripes.

A rough estimate of a typical mile of broken stripped markings is \$2,500 per Mile.

Estimator should use designed lengths of single solid, single dashed, and double solid to make estimate; estimate using time, equipment, and materials.

Campground and parking area striping will cost more due to the short lengths, intermittent markings, and tighter working areas.

PART X. EQUIPMENT RATES

The cost per hour shown in this section are for equipment rates only. Operator rates are not included. Operator rates can be found in PART XI. LABOR RATES. The equipment rates include fuel, oil, lubrication, repairs, maintenance, insurance, profit and overhead. Profit and overhead included herein is 16 percent. The cost of moving most equipment to the job is included in Section 151. - MOBILIZATION.

The rate shown were derived from the *Rental Rate Blue Book for Construction Equipment*. Rates are given for Idaho and Montana. For North and South Dakota, decrease the Montana rates by 1.0 percent and 0.5 percent respectively. The models shown should be considered typical and their rates can be applied to similar equipment. The rates reflect the variations between national averages and states caused by the differences in construction seasons and the costs of labor, freight, taxes, etc.

Rates for most equipment are for the same model for the years 2002 and 2012. Some models listed are no longer manufactured or were not manufactured during the years under which they are classified. In these cases, equipment of different years and/or models are given. Examples of their listings and interpretations are as follows:

Caterpillar D5 K XL/D5G XL, Diesel, Enclosed Rollover Protection Structure (ROPS), Dozer Type: VPAT, 96/90HP
The rate for a 2002 model is for a D5G which has 90 HP and the rate for a 2012 model is for a D5K with 96 HP.

Caterpillar 330D L/330C L, Diesel, 36.2/35.1 MTon, Bucket Capacity - Heaped: 1.56/2.25, 266/244 HP (2009/2002)
The rate for 2002 is for a 330C L, 35.1 MTon, bucket capacity of 2.25 CY and 244 HP. The rate under the 2012 column is for a 330D 2009 model, 36.2 MTons, bucket capacity of 1.56 CY and 266 HP.

Caterpillar 311C U, Diesel, 12 MTon, Bucket Capacity - Heaped: 0.39CY, 79 HP (2008/2002)
The rates given are for a 2008 and 2002 model.

Under most situations, the estimator should use the equipment rates listed for the older equipment with compatible production rates. Newer equipment rates may be used when they are expected to be used for the work being estimated. Local rates should be used if local equipment is generally available at a rate different than those shown herein. Note that in rare cases the newer equipment rates are lower than that for older equipment and in several cases the difference is minimal.

For rates not shown in the following tables, estimator should refer to *Blue Book* equipment rates and apply age and 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 are for work in excess of 40 hours.

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.

Equipment rates are based on the following on-highway fuel prices and adjustments may be required.

- Diesel price: \$2.36/gallon, Gasoline price: \$2.34/gallon.

Note that off-highway fuel may be used for some operations. Use the following table to make adjustment.

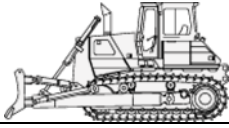
Table 80. Federal and State Fuel Taxes per Gallon for Idaho, Montana, North Dakota and South Dakota

Fuel Taxes Federal and State	Idaho	Montana	North Dakota	South Dakota
Gasoline	\$0.514	\$0.5065	\$0.4143	\$0.484
Diesel	\$0.574	\$0.544	\$0.4743	\$0.544

EQUIPMENT RATES (COST/HR WITHOUT OPERATOR)

2017 Rental Rate Blue Book +10% overhead + 6 % profit

Table 81. Dozer Cost per Hour for 5 and 15 Year Old Equipment for Idaho and Montana

Equipment Class – Model, Description, Picture of Equipment (model year if different) ³	Idaho 2012	Idaho 2002	Montana 2012	Montana 2002
Crawler Tractor Single and Multi-Shank Rippers - 129HP, Parallelogram, 3 Shanks	\$7.56	\$7.22	\$8.01	\$7.62
Crawler Tractor Single and Multi-Shank Rippers - 259 HAP to 260 HP, Parallelogram, 3 Shanks	\$20.04	\$19.01	\$21.38	\$20.23
Crawler Tractor Single and Multi-Shank Rippers - SSR-359H Crawler Tractor Single Shank Rippers Over 260HP 46" depth to 359 HP	\$31.09	\$29.42	\$33.19	\$31.34
Standard Crawler Dozer – Caterpillar D3 K XL/G XL, Diesel, Rollover Protection Structure (ROPS), Dozer Type: Variable Pitch Angle and Tilt (VPAT), 74/70HP 	\$61.59	\$57.56	\$64.51	\$60.13
Standard Crawler Dozer - Caterpillar D4K XL/D4G XL, Diesel, ROPS, Dozer Type: VPAT, 84/80 HP	\$70.99	\$64.46	\$74.51	\$67.38
Standard Crawler Dozer – Caterpillar D5K XL/D5G XL, Diesel, Enclosed Rollover Protection Structure (ROPS), Dozer Type: VPAT, 96/90HP	\$81.41	\$70.31	\$85.53	\$73.51
Standard Crawler Dozer - Caterpillar D6N DS XL, Diesel, EROPS, Dozer Type: VPAT, 150 HP	\$115.86	\$112.70	\$121.81	\$118.30
Standard Crawler Dozer - Caterpillar D7R DS Series II, Diesel, EROPS, Dozer Type: Semi-U, 240 HP	\$175.15	\$170.30	\$184.29	\$178.90
Standard Crawler Dozer - Caterpillar D8T, Diesel, EROPS, Dozer Type: Semi-U, 310 HP (2012/2004)	\$244.94	\$238.55	\$258.64	\$251.54
Standard Crawler Dozer - Caterpillar D9T, Diesel, EROPS, Dozer Type: Semi-U, 405 HP	\$308.73	\$300.99	\$325.32	\$316.71
Standard Crawler Dozer - Deere 450J LT, Diesel, ROPS, Dozer Type: PAT, 77 HP	\$63.77	\$62.35	\$66.80	\$65.22
Standard Crawler Dozer - Deere 550J LT, Diesel, ROPS/Falling Object PS (FOPS), Dozer Type: PAT, 85 HP	\$70.92	\$69.28	\$74.41	\$72.59
Standard Crawler Dozer - Deere 750J LGP, Diesel, ROPS, Dozer Type: PAT, 155 HP	\$119.11	\$116.62	\$125.17	\$122.39
Standard Crawler Dozer - Deere 850J LGP, Diesel, ROPS, Dozer Type: PAT, 200 HP	\$142.62	\$139.70	\$149.73	\$146.49

³ Equipment listed with different model year than 2002 and 2012. Model year used is shown in parentheses.

Table 82. Hydraulic Excavator Cost per Hour for 5 and 15 Year Old Equipment for Idaho and Montana

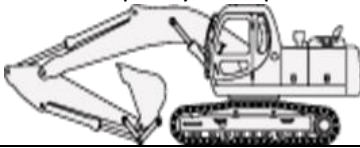
Equipment Class – Model, Description, Picture of Equipment (model year if different)	Idaho 2012	Idaho 2002	Montana 2012	Montana 2002
Crawler Mounted - Caterpillar 311C U, Diesel, 12 MTon, Bucket Capacity - Heaped: 0.39cy, 79 HP (2008/2002) 	\$73.47	\$71.72	\$77.53	\$75.57
Crawler Mounted - Caterpillar 312C L/312D L, Diesel, 13.14 MTon, Bucket Capacity - Heaped: 0.68cy, 90 HP	\$79.14	\$73.31	\$83.06	\$77.03
Crawler Mounted - Caterpillar 320C L/320D L, Diesel, 21.6/21 MTon, Bucket Capacity - Heaped: 1.18 /1. 25cy, 148/138 HP	\$111.08	\$117.26	\$116.53	\$123.22
Crawler Mounted - Caterpillar 325D L/325C L, Diesel, 28.6/29.2 MTon, Bucket Capacity-Heaped: 1.5/1.44cy, 186/188 HP (2009/200)2	\$158.07	\$150.55	\$166.31	\$158.07
Crawler Mounted - Caterpillar 330D L/330C L, Diesel, 36.2/365.1 MTon, Bucket Capacity - Heaped: 1.56/2.25CY, 266/244 HP (2009/2002)	\$196.89	\$183.08	\$206.69	\$191.98
Crawler Mounted - Deere 120D /120C, Diesel, 12.8/13.08MTon, Bucket Capacity - Heaped: 0.79/0.78cy, 93/89 HP (2012/2008)	\$78.46	\$73.25	\$82.64	\$76.97
Crawler Mounted - Deere 200 D LC/200C, Diesel, 22.7/20.9MTon, Bucket Capacity - Heaped: 1.19/1.12cy, 159/1541 HP (2011/2002)	\$116.16	\$100.90	\$121.73	\$105.50
Crawler Mounted - Hitachi ZAXIS 200LC-3/200LC, Diesel, 21.3/20.6 MTon, Bucket Capacity - Heaped: 1.19/1.12cy, 159/147 HP	\$115.93	\$108.09	\$121.63	\$113.12
Crawler Mounted - Hitachi ZAXIS 270LC-3/270LC, Diesel, 28.6/28.5 MTon, Bucket Capacity - Heaped: 1.75/1.6cy, 188/173 HP (2011/2002)	\$146.33	\$138.79	\$153.83	\$145.62
Crawler Mounted - Komatsu PC120LC-6, Diesel, 12.06 MTon, Bucket Capacity - Heaped: 0.61cy, 89 HP (2008/2002)	\$75.58	\$73.19	\$78.82	\$76.93
Crawler Mounted - Komatsu PC-160LC-8/PC160LC-7, Diesel, 16.9/16.6 MTon, Bucket Capacity - Heaped: 0.85cy, 115 HP (2012/2003)	\$93.64	\$90.07	\$98.59	\$94.52
Crawler Mounted - Komatsu PC200-8, Diesel, 20.01 MTon, Bucket Capacity - Heaped: 1.34cy, 148 HP	\$105.39	\$102.44	\$110.42	\$107.39
Crawler Mounted - Komatsu PC220LC-8/PC200LC-7, Diesel, 24.9/24.5 MTon, Bucket Capacity - Heaped: 1.5/1.57cy, 168 HP	\$125.68	\$136.66	\$131.79	\$143.41
Crawler Mounted - Komatsu PC270LC-8/PC270LC-7, Diesel, 30.1/28.9MTon, Bucket Capacity - Heaped: 1.85/1.59CY, 187/179 HP	\$133.44	\$147.30	\$139.81	\$154.69

Table 83. Loader Cost per Hour for 5 and 15 Year Old Equipment for Idaho and Montana





Equipment Class – Model, Description, Picture of Equipment(model year if different)	Idaho 2012	Idaho 2002	Montana 2012	Montana 2002
4WD Articulated Wheel Loader - Case 21E, Diesel, Bucket Capacity - Heaped: 0.92cy, EROPS, 50 HP  (2012/2005)	\$35.65	\$34.75	\$37.39	\$36.39
4WD Articulated Wheel Loader - Case 521E XT/521D XT, Diesel, Bucket Capacity 2.1/2 cy, EROP, 135/110 HP	\$61.22	\$54.96	\$63.90	\$57.40
4WD Articulated Wheel Loader - Caterpillar IT38H/IT38G, Diesel, Bucket Capacity - Heaped: 3.3/3.0cy, EROPS, 179/160 HP	\$83.88	\$67.37	\$87.86	\$70.05
4WD Articulated Wheel Loader - Komatsu WA250-6, Diesel, Bucket Capacity - Heaped: 3.0cy, EROPS, 138 HP	\$59.81	\$58.25	\$62.35	\$60.60
Skid Steer - Bobcat 543, Diesel, 800lbs operating capacity 800lbs, 21.5 HP 	\$18.03	\$17.70	\$18.93	\$18.57
Skid Steer - Bobcat S185, Diesel, 1850 lbs operating capacity, ROPS/FOPS 61 HP	\$44.43	\$42.55	\$46.74	\$45.81
Standard Crawler Loader - Case 1155E, Diesel, Bucket Capacity: 2cy, ROPS, 118 HP 	\$71.65	\$69.97	\$74.92	\$73.05
Standard Crawler Loader - Caterpillar 953D/953C, Diesel, Bucket Capacity: 2.41/2.42cy, EROPS, 148/128 HP	\$130.61	\$107.45	\$137.61	\$113.13
Standard Crawler Loader - Caterpillar 963D/963C, Diesel, Bucket Capacity: 3.0/3.2cy, EROPS, 189/158 HP	\$161.00	\$138.68	\$169.70	\$145.69
Tractor-Loader-Backhoe - Case 580 Super M Series 2/Series 3, Diesel, 2WD, Loader Bucket Capacity - Heaped: 1.03/1.00cy, Backhoe Stick Fixed, ROPS, 91/90 HP , (2003/2012) 	\$47.21	\$45.15	\$49.22	\$46.91
Tractor-Loader-Backhoe - Caterpillar 420E IT, Diesel, 4WD, Loader Bucket Capacity - Heaped: 1.25cy, EROPS, 93 HP	\$53.25	\$51.80	\$55.60	\$54.12
Tractor-Loader-Backhoe - Deere 310J/310G, Diesel, 2WD, Loader Bucket Capacity - Heaped: 1.25/1.00cy, Backhoe Stick Fixed, ROPS/FOPS, ROPS/FOPS, 84/70 HP	\$45.14	\$37.97	\$47.08	\$39.50

Table 84. Motor Grader Cost per Hour for 5 and 15 Year Old Equipment for Idaho and Montana

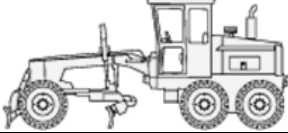
Equipment Class – Model, Description, Picture of Equipment(model year if different)	Idaho 2012	Idaho 2002	Montana 2012	Montana 2002
Articulated Frame Grader - Caterpillar 120M/120H, Diesel, ROPS/EROPS, 12' Moldboard, 138/125 HP 	\$96.92	\$67.66	\$102.14	\$70.57
Articulated Frame Grader - Caterpillar 140M/140H, Diesel, ROPS/EROPS, 12' Moldboard, 183/165 HP	\$109.11	\$101.68	\$114.73	\$106.41
Articulated Frame Grader - Caterpillar 14M/14H, Diesel, ROPS/EROPS, 14' Moldboard, 259/220 HP	\$161.51	\$130.26	\$170.30	\$136.64
Articulated Frame Grader - Caterpillar 16M, Diesel, EROPS, 16' Moldboard, 297 HP	\$204.70	\$197.14	\$216.31	\$207.90
Articulated Frame Grader - Deere 770G, Diesel, EROPS, 12' Moldboard, 165 HP	\$103.44	\$102.55	\$108.76	\$107.79
Grader Rear Ripper/Scarifier - GRS-180H up to 180 HP, 3 Shanks	\$6.74	6.44	\$7.08	\$6.74
Grader Rear Ripper/Scarifier - GRS-185 HP and over, 3, Shanks	\$11.07	\$10.50	\$11.70	\$11.07

Table 85. Air Equipment Cost per Hour for 5 and 15 Year Old Equipment for Idaho and Montana

Equipment Class – Model, Description, Picture of Equipment(model year if different)	Idaho 2012	Idaho 2002	Montana 2012	Montana 2002
Air Track Drill - Atlas Copco VL140/CM345, 4" hole size, Drill Type: Drifter	\$60.61	\$56.28	\$64.70	\$59.47
Air Track Drill - Atlas Copco YD90/LM100A, 2-1/2" hole size, Drill Type: Drifter	\$50.09	\$46.74	\$53.33	\$49.60
Hand-Held Pavement Breaker 25-30 lbs	\$1.18	\$1.11	\$1.24	\$1.16
Pneumatic Impact Breaker - Allied AR 75B 750 ft lbs 600/1000bpm 790 lbs	\$14.29	\$13.63	\$14.26	\$13.63
Pneumatic Impact Breaker - Atlas Copco MB 1000 CLII Dust 2500 ft lbs 350/750 bpm 2,200 lbs	\$34.04	\$32.49	\$34.04	\$32.49
Portable Rotary Screw Air Compressor - Diesel, 100psi, 100 cfm, 32 HP	\$12.29	\$12.09	\$12.70	\$12.48
Portable Rotary Screw Air Compressor - Diesel, 100psi, 160 cfm, 60 HP	\$19.18	\$18.95	\$19.67	\$18.95
Portable Rotary Screw Air Compressor - Diesel, 100psi, 450 cfm, 150 HP	\$46.08	\$45.51	\$47.28	\$45.49
Portable Rotary Screw Air Compressor - Diesel, 125psi, 375 cfm, 115 HP	\$36.57	\$36.12	\$37.53	\$37.04
Portable Rotary Screw Air Compressor - Diesel, 150psi, 600 cfm, 275 HP	\$77.00	\$76.21	\$78.65	\$77.78

Table 86. Compaction Equipment Cost per Hour for 5 and 15 Year Old Equipment for Idaho and Montana

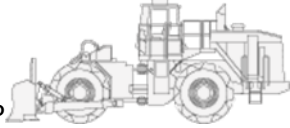

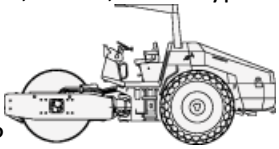
Equipment Class – Model, Description, Picture of Equipment(model year if different)	Idaho 2012	Idaho 2002	Montana 2012	Montana 2002
Hand-Held Rammer - Gasoline, 3180 lbs/blow, Shoe Size: 4"-13", 4 HP	\$6.09	\$5.79	\$6.29	\$5.97
Hydraulic Compactor for Backhoe Mounting - Allied 1600 W/Swivel, 16000lbs, 2100 cycles/minute	\$13.25	\$12.73	\$13.95	\$13.37
Self-Propelled Pad Foot Compactor - Caterpillar 815F Series 2 Diesel, Wheel size: 39"x41", Power shift transmission, 232 HP 	\$201.15	\$195.42	\$208.45	\$202.32
Self-Propelled Pneumatic Compactor - Caterpillar PS-150C, 2.4MTons, Diesel, 9 wheels, 2/2 speeds, 96HP 	\$61.59	\$60.24	\$64.14	\$62.70
Self-Propelled Pneumatic Compactor - Hamm GRW18, 3.5MTons, Diesel, 8 wheels, 3F/3R speeds, 114HP	\$79.79	\$78.09	\$83.06	\$81.24
Single Drum Vibratory Compactor - Caterpillar CP-433E, 5-7.9MTons, Diesel, Drum Type: Pad foot, Drum Width: 66", 96 HP 	\$49.80	\$48.29	\$51.10	\$49.48
Towed Pneumatic Compactor - Hercules PT-9, 9.6tons, 9 wheels	\$17.96	\$17.52	\$18.75	\$18.27
Towed Steel Drum Static Compactor - Hercules GTD 5496, 2 drums, Drum Type: Grid	\$21.18	\$20.32	\$22.21	\$21.31

Table 87. Miscellaneous Equipment Cost per Hour for 5 and 15 Year Old Equipment for Idaho and Montana

Equipment Class – Model, Description, Picture of Equipment(model year if different)	Idaho 2012	Idaho 2002	Montana 2012	Montana 2002
Truck Scale - Steel Deck, 60 tons, 70'x10'	\$21.44	\$20.74	\$21.44	\$20.74
Walk-Behind Chain Trencher - Ditch Witch 1820, Gasoline, 3.25-inch Trench Width, 48-inch Trench Depth, 17.5 HP (2002/2008)	\$15.38	\$15.22	\$15.94	\$15.75
Enclosed Horizontal Motor - 1200 RPM, 575/460 Volts, 25 HP, no fuel	\$2.48	\$2.34	\$2.69	\$2.53
Enclosed Horizontal Motor - 1200 RPM, 575/460 Volts, 100 HP no fuel	\$7.80	\$7.38	\$8.41	\$7.93
Heavy Duty Centrifugal Pump - Gasoline, 8M CPB Rating, 2-inch, 9600 gph, 9 HP	\$10.24	\$10.10	\$10.74	\$10.57
Heavy Duty Centrifugal Pump - Gasoline, 20M CPB Rating, 3-inch, 20000 gph, 18 HP	\$15.48	\$15.27	\$16.20	\$15.96
Heavy Duty Centrifugal Pump - Diesel, 18M CPB Rating, 3-inch, 18000 gph, 10 HP	\$9.28	\$9.12	\$9.82	\$9.64
Heavy Duty Centrifugal Pump - Diesel, 40M CPB Rating, 4-inch, 40000 gph, 45 HP	\$24.24	\$23.92	\$25.40	\$25.02
Large Generator Set - Diesel, 60 kW, Open Enclosure, 88 HP	\$37.55	\$36.97	\$38.47	\$37.80
Large Generator Set - Diesel, 90 kW, Open Enclosure, 130 HP	\$49.87	\$49.26	\$50.83	\$50.13
Large Generator Set - Diesel, 150 kW, Open Enclosure, 240 HP	\$85.83	\$85.03	\$87.08	\$86.16
Large Generator Set - Diesel, 300 kW, Open Enclosure, 400 HP	\$140.64	\$139.39	\$142.58	\$141.16
Small Generator Set - Gasoline, 1000 w, 3.5 HP	\$3.03	\$2.97	\$3.09	\$3.03
Small Generator Set - Gasoline, 3000 w, 8 HP	\$5.28	\$5.22	\$5.39	\$5.30
Pressure Washer Hot - Gasoline, 4 gpm, 1000 psi, Portable, 8 HP	\$9.63	\$9.31	\$10.11	\$9.74
Pressure Washer Hot - Gasoline, 5 gpm, 3000 psi, Portable, 16 HP	\$12.70	\$12.30	\$13.14	\$13.05
Suction Hose - 2-inch, 25 ft	\$0.17	\$0.14	\$0.20	\$0.15
Suction Hose - 3-inch, 25 ft	\$0.26	\$0.21	\$0.30	\$0.24
Suction Hose - 4-inch, 25 ft	\$0.29	\$0.23	\$0.34	\$0.27
Chain Saw - Gasoline, 3cu.in., 20" bar length	\$3.40	\$3.40	\$3.51	\$3.51
Cordless Drill - Electric, Variable 2-spd, Rev., 1000/370 RPM, 0.5-inch	\$0.80	\$0.80	\$0.84	\$0.84

Table 88. Paving & Chip Sealing Equipment Cost per Hour for 5 and 15 Year Old Equipment for Idaho and Montana

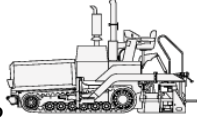

Equipment Class – Model, Description, Picture of Equipment(model year if different)	Idaho 2012	Idaho 2002	Montana 2012	Montana 2002
Crawler Mounted Asphalt Paver - Caterpillar AP- AP- 655D/655C, Diesel, Screed Model: 8-16B Extend-A-Mat/AS4251C, 174/158HP 	\$295.54	\$299.13	\$297.48	\$301.11
Crawler Mounted Asphalt Paver - Lee Boy 1000F/1000EZ, Diesel, Screed Model: Extendable/Legend (8'-13'/15' width), 44/37 HP	\$58.44	\$57.19	\$58.80	\$57.53
Pull Type Pavement Broom - Drive Type: Engine, 84-inch broom length, 20 HP	\$17.44	\$16.61	\$18.14	\$17.23
Self Propelled Chip Spreader - Rosco SPR-H, Diesel, 10ft Spreader Hopper, 152 HP	\$119.88	\$116.58	\$124.13	\$120.50
Self Propelled Pavement Broom - Diesel, Hydrostatic Transmission, 84-inch broom length, 80 HP	\$43.77	\$42.86	\$45.41	\$44.37
Towed Chip Spreader - Gasoline, w/ Chain Conveyor, 7ft Spreader Hopper, 7 HP	\$5.64	\$5.49	\$5.80	\$5.64
Wheel Mounted Asphalt Paver - Lee-Boy 1000F/1000EZ, Diesel, Screed Model: Legend (8'-13'/15' width), 37 HP 	\$78.45	\$78.19	\$78.91	\$78.65
Wheel Mounted Asphalt Paver - Caterpillar AP- 500E/AP- 800C, Diesel, Screed Model: 10-20 Extend-A-Mat/AS2252C, 129/100 HP	\$249.73	\$230.92	\$251.43	\$232.47
Wheel Mounted Asphalt Paver - Caterpillar AP- 1000D/AP-1000B, Diesel, Screed Model: 10-20 Extend-A-Mat, 222/158 HP	\$303.32	\$287.62	\$305.25	\$289.48
Asphalt Distributors For Truck Mounting - Power Mode: PTO, 1100 Gallon, Includes Burners, insulated tank, and circulating spray bar, propane	\$39.51	\$38.08	\$39.79	\$38.35
Asphalt Distributors For Truck Mounting - Power Mode: PTO, 1600 Gallon, Includes Burners, insulated tank, and circulating spray bar, propane	\$41.10	\$39.65	\$41.39	\$36.67
Asphalt Distributors For Truck Mounting - Power Mode: PTO, 3100 Gallon, Includes Burners, insulated tank, and circulating spray bar, propane	\$46.41	\$44.81	\$46.73	\$45.10

Table 89. Feller Buncher Cost per Hour for 5 and 15 Year Old Equipment for Idaho and Montana

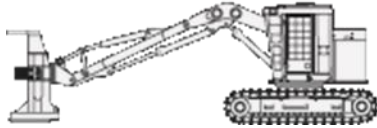

Equipment Class – Model, Description, Picture of Equipment(model year if different)	Idaho 2012	Idaho 2002	Montana 2012	Montana 2002
Crawler Mounted Feller Buncher - Deere 753G, Diesel, 181 HP (2008/2002) 	\$228.12	\$221.73	\$228.12	\$221.73
Wheel Mounted Feller Buncher - Deere 643J, Diesel, Hydrostatic, 2-spd Transmission, 174 HP (2012/2006) 	\$165.97	\$162.12	\$165.97	\$162.12

Table 90. Skidder Cost per Hour for 5 and 15 Year Old Equipment for Idaho and Montana



Equipment Class – Model, Description, Picture of Equipment(model year if different)	Idaho 2012	Idaho 2002	Montana 2012	Montana 2002
Cone Crusher - Electric, Cone Type: Standard, Head Size:45", 125 HP required	\$51.77	\$47.75	\$55.42	\$50.92
Wheel Mounted Cable Log Skidder - Deere 540G III, Diesel, Powershift Transmission, 129 HP 	\$107.94	\$105.22	\$107.94	\$105.22
Wheel Mounted Cable Log Skidder - Franklin 170 S2, Diesel, Powershift Transmission, 155 HP	\$100.39	\$98.23	\$100.39	\$98.23
Wheel Mounted Cable Log Skidder - Caterpillar 525C/525B, Diesel, Powershift Transmission, 41270/39342 lbs maximum Line Pull, 182/160HP	\$163.31	\$132.10	\$163.31	\$132.10
Wheel Mounted Grapple Log Skidder - Caterpillar 525C/525B, Diesel, Powershift Transmission, 39342 lbs maximum Line Pull, 120-inch Grapple, 182/160 HP 	\$153.20	\$140.68	\$153.20	\$140.68
Wheel Mounted Grapple Log Skidder - Franklin 405 S2, Diesel, Powershift Transmission, 155 HP	\$104.66	\$101.87	\$104.66	\$101.87

Table 91. Mower/Brush Cutter/Mulcher/Seeder Cost per Hour for 5 and 15 Year Old Equipment for Idaho and Montana

Equipment Class – Model, Description, Picture of Equipment(model year if different)	Idaho 2012	Idaho 2002	Montana 2012	Montana 2002
Rotary Mower - PTO, Type: Rotary(Side mounted), 5.5ft Blade, 50 HP	\$13.50	\$12.96	\$14.21	\$13.61
Rotary Mower - PTO, Type: Rotary(Rear mounted), 10ft Blade, 90 HP	\$16.34	\$15.61	\$17.28	\$16.48
Rubber Tired Brush Cutter - Hydo-Ax 721E, Diesel, 210 HP (2006/2002)	\$185.74	\$182.93	\$185.74	\$182.93
Rubber Tired Brush Cutter - Kershaw 500, 8ft Cutter, 200 HP (2007/2012)	\$203.05	\$197.39	\$203.05	\$197.39
Rubber Tired Brush Cutter - Kershaw 1200, 225 HP (2010/2002)	\$206.30	\$200.40	\$206.30	\$200.40
Towed Mower - PTO, Type: Flail, 7ft Blade, 55 HP	\$5.72	\$5.24	\$6.11	\$5.59
Trailer Mounted Brush Chipper - Bandit 150XP, Diesel, 12-inch, 125 HP	\$62.32	\$60.61	\$62.32	\$60.61
Trailer Mounted Mulcher - Reinco M90, Diesel, 20 tons per hour, 115 HP	\$42.39	\$41.35	\$43.69	\$42.54
Trailer Mounted Mulcher - Reinco TM-35X Gasoline, 7 tons per hour, 34 HP	\$18.00	\$17.53	\$18.59	\$18.07
Seed Sprayer for Truck Mounting - Reinco HG-10GX, Gasoline, 1250 Gallon, 34 HP	\$20.48	\$19.92	\$21.15	\$20.52

Table 92. Rock Crushing Equipment Cost per Hour for 5 and 15 Year Old Equipment for Idaho and Montana

Equipment Class – Model, Description, Picture of Equipment(model year if different)	Idaho 2012	Idaho 2002	Montana 2012	Montana 2002
Cone Crusher - Electric, Cone Type: Standard, Head Size:45", 125 HP required	\$51.77	\$47.75	\$55.42	\$50.92
Double Deck Portable Screening Plant - Gasoline, Screen Width: up to 36", Screen Size: 3'x6', Conveyor Size: 30"x60', 60 HP	\$54.47	\$52.95	\$56.62	\$54.93
General Purpose Portable Belt Conveyor - Diesel, up to 23" Belt Width, Conveyor Size: 18"x30', 150 tons per hour, 40 HP00	\$25.42	\$24.56	\$26.52	\$25.57
Gravel Plant - Pioneer 2036-3024 Duplex, Electric, Roll Crusher Size:30"x24" Triple, Jaw Crusher Size: 20"x36", Screen Size: 48"x14', 295 HP required	\$149.05	\$140.72	\$158.48	\$149.18
Heavy Duty Apron Feeder - Electric, 3 Chains, Size: 36"x14', 7.5 HP	\$31.67	\$28.58	\$34.07	\$30.62
Jaw Crusher - Electric, Gape Sizes: 25"-41", Feed Size: 15"x36", 75 HP required	\$30.97	\$28.97	\$33.08	\$30.84
Radial Stacker - Diesel, up to 23" Belt Width, Conveyor Size: 18"x100', 170 tons per hour, 38 HP	\$41.81	\$39.88	\$44.09	\$41.94
Roll Crusher - Electric, Roll Type: Double, Rotor Size (DxW): 30"x25", 100-200 HP required	\$32.86	\$29.97	\$35.41	\$32.18
Triple Deck Portable Screen Plant - Diesel, Screen Width: 37" and over, Screen Size: 5'x10', Conveyor Size: 42"x50', 110 HP	\$79.55	\$76.97	\$83.09	\$80.20

Table 93. Trailer Cost per Hour for 5 and 15 Year Old Equipment for Idaho and Montana

Equipment Class – Model, Description, Picture of Equipment(model year if different)	Idaho 2012	Idaho 2002	Montana 2012	Montana 2002
Cone Crusher - Electric, Cone Type: Standard, Head Size:45", 125 HP required	\$51.77	\$47.75	\$55.42	\$50.92
Fixed Gooseneck Equipment Trailer - 3 Axles, Drop Deck, 17' Deck Length, 35ton	\$21.29	\$20.16	\$22.55	\$21.30
Fixed Gooseneck Equipment Trailer - 3 Axles, Drop Deck, 17'-18' Deck Length, 50ton	\$21.83	\$20.68	\$23.13	\$21.84
Folding Gooseneck Equipment Trailer - 4 Axles, Drop Deck, 16 tires, 75ton	\$33.70	\$31.77	\$35.82	\$33.70
On-Highway Bottom Dump Semi-Trailer - 1 Gate, Capacity: 18cy, Payload: 27ton	\$13.75	\$12.95	\$14.60	\$13.72
Off-Highway Bottom Dump Trailer - Load King 2030, Capacity: 20cy, Payload: 30ton	\$39.66	\$39.10	\$41.63	\$40.99
Off-Highway Bottom Dump Trailer - Load King 2842, Capacity: 28cy, Payload: 42ton	\$40.86	\$40.28	\$42.89	\$42.26
Standard Field Office Trailer - 8'X24'	\$2.37	\$2.25	\$2.49	\$2.37

Table 94. Truck Cost per Hour for 5 and 15 Year Old Equipment for Idaho and Montana

Equipment Class – Model, Description, Picture of Equipment(model year if different)	Idaho 2012	Idaho 2002	Montana 2012	Montana 2002
Mechanical Drive Rear Dump - Caterpillar 770/769D, 36.3/36.4MTons, Diesel, 22.3-31.7cy, 476/487 HP	\$182.55	\$176.02	\$191.56	\$183.85
Mechanical Drive Rear Dump - Caterpillar773F/773E, 55/54.4 MTons, Diesel, 35-46.5/34.8-46.4 CY, 703/671 HP	\$252.52	\$221.61	\$264.87	\$231.36
Mechanical Drive Rear Dump - Deere 460E 41.8 MTons Diesel 26.9-33.4 cy, 481 HP	\$185.50	--	\$194.38	--
On-Highway Flatbed Truck - Diesel, 4x2, 15000 maximum gross vehicle weight, 200 HP	\$32.98	\$32.04	\$33.69	\$32.66
On-Highway Flatbed Truck - Diesel, 4x2, 25000 maximum gross vehicle weight, 200 HP	\$36.15	\$34.91	\$37.09	\$35.71
On-Highway Light Duty Truck - Diesel, 4x2, Conventional Cab, 3/4ton, 160 HP	\$17.28	\$16.92	\$17.74	\$17.35
On-Highway Light Duty Truck - Diesel, 4x4, Conventional Cab, 3/4ton, 160 HP	\$17.97	\$17.57	\$18.48	\$18.06
On-Highway Light Duty Truck - Diesel, 4x4, Crew Cab, 1ton, 340 HP	\$31.59	\$31.09	\$32.25	\$31.69
On-Highway Light Duty Truck - Gasoline, 4x4, Crew Cab, 3/4ton, 285 HP	\$36.52	\$36.14	\$37.03	\$36.60
On-Highway Rear Dump - Diesel, 6x4, 40000lbs maximum gross vehicle weight, 8-10cy, 315 HP	\$77.05	\$74.52	\$78.80	\$77.17
On-Highway Rear Dump - Diesel, 6x4, 50000lbs maximum gross vehicle weight, 10-12cy, 400 HP	\$96.44	\$93.22	\$98.65	\$95.11
On-Highway Rear Dump - Diesel, 6x4, 70000lbs maximum gross vehicle weight, 12-18cy, 400 HP	\$104.32	\$100.43	\$107.02	\$102.72
On-Highway Truck Tractor - Diesel, 6x4, 50000lbs maximum gross vehicle weight, 310 HP	\$76.74	\$74.63	\$78.91	\$76.58
On-Highway Truck Tractor - Diesel, 6x4, 75000lbs maximum gross vehicle weight, 400 HP	\$92.85	\$90.49	\$95.26	\$92.66
On-Highway Water Tanker - Gasoline, 2000 Gallon, 175 HP	\$54.09	\$52.91	\$55.15	\$53.84
On-Highway Water Tanker - Diesel, 3000 Gallon, 190 HP	\$47.85	\$46.30	\$49.22	\$47.51
On-Highway Water Tanker - Diesel, 4000 Gallon, 250 HP	\$71.03	\$68.43	\$73.32	\$70.46

PART XI. LABOR RATES

LABOR RATES

Construction Wage Rate (Davis-Bacon) + payroll loading + 10 percent OH + 6 percent profit)

Table 95. Labor Rates by Classification for Labor Zones in the State of Idaho

Classification	Kootenai County	Nez Perce County Zone 1	Nez Perce County Zone 2	Rest of Idaho
General Laborer	\$41.52	\$42.42	\$42.42	\$42.14
Driller, Air Track	\$49.18	\$48.78	\$48.78	\$48.53
Sawyer	\$46.15	\$46.57	\$46.57	\$48.55
Powderman	\$43.55	\$45.10	\$45.10	\$45.90
Tractor Operator (to D6 or equiv)	\$57.29	\$50.90	\$53.56	\$47.62
Tractor Operator (D6 or larger)	\$57.29	\$50.90	\$53.56	\$47.62
Grader Operator	\$48.21	\$48.24	\$48.24	\$46.58
Loader Operator (4 CY and less)	\$48.35	\$48.33	\$48.33	\$46.27
Loader Operator (over 4 CY)	\$48.35	\$48.33	\$48.33	\$46.27
Backhoe Operator (under 3 CY)	\$47.95	\$47.57	\$47.57	\$47.29
Shovel/Hyd Excavator	\$47.95	\$47.57	\$47.57	\$47.29
Lowboy/Semi-Tractor (under 50 T)	\$50.77	\$50.77	\$50.77	\$44.78
Dump Truck Driver (12 CY and less)	\$47.40	\$45.31	\$45.31	\$43.64
Dump Truck Driver (over 12 CY)	\$47.40	\$45.31	\$45.31	\$43.64
Skidder Cat Operator	\$50.92	\$50.92	\$50.92	\$51.17
Rubber Tired Skidder	\$50.92	\$50.92	\$50.92	\$51.17
Log Loader Operator	\$52.48	\$52.45	\$52.45	\$50.35

Table 96. Labor Rates by Classification for Labor Zones in the State of Montana

Classification	Zone 1	Zone2	Zone 3
General Laborer	\$39.65	\$43.10	\$43.79
Driller, Air Track	\$49.99	\$53.68	\$54.42
Sawyer	\$47.22	\$51.31	\$52.12
Powderman	\$45.08	\$48.77	\$49.51
Tractor Operator (to D6 or equivalent)	\$47.42	\$50.87	\$51.56
Tractor Operator (D6 or larger)	\$47.42	\$50.87	\$51.56
Grader Operator	\$47.42	\$50.87	\$51.56
Loader Operator (4 CY and less)	\$47.42	\$50.87	\$51.56
Loader Operator (over 4 CY)	\$48.61	\$52.06	\$52.75
Backhoe Operator (under 3 CY)	\$47.42	\$50.87	\$51.56
Shovel/Hydraulic Excavator	\$47.42	\$50.87	\$51.56
Lowboy/Semi-Tractor (under 50 Ton)	\$46.58	\$50.03	\$50.72
Dump Truck Driver (12 CY and less)	\$46.58	\$50.03	\$50.72
Dump Truck Driver (over 12 CY)	\$46.58	\$50.03	\$50.72
Skidder Cat Operator	\$54.06	\$58.14	\$58.96
Rubber Tired Skidder	\$54.06	\$58.14	\$58.96
Log Loader Operator	\$55.46	\$59.55	\$60.36

PAYROLL LOADING RATE

Social Security + Workers' Comp + Unemployment

Table 97. Payroll Loading Rate in Percent by Class for Idaho and Montana

Class Description	Class	Idaho	Montana
Forest Road Construction/Separate Contract	5511	N/A	27.39%
R/W Timber or Forest Road Construction/No Separate Contract	2702	28.47%	40.88%
Surface or Paving Work	5506	15.87%	20.39%
Subsurface Work or Road Construction/Major Road	5507	14.83%	18.93%
Quarry Work	5508	18.92%	27.42%
Crushing Only	1710	15.20%	17.12%
Log Haul	2727	28.47%	32.80%

PART XII. TEMPORARY ROAD COST ESTIMATING

COST ESTIMATING FOR TEMPORARY ROADS

Table 98. Basic Temporary Road Costs by Mile for Idaho, Table 99. Basic Temporary Road Costs by Mile for Montana, Table 100. Costs for Culverts for Temporary Roads in Idaho and Montana, and Table 101. Cost per Mile for Obliteration of Temporary Roads in Idaho and Montana have been adjusted to reflect Wood's Rates for Idaho and Montana. Profit (6%) has been removed since it is included in the timber sale appraisal. No adjustments should be made when using these cost in Timber Sale packages

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 outslowing, removal of culverts and ditches, and building water bars or cross ditches after the road is no longer needed.

For timber sales, FSH 2409.18 Chapter 40 Part 45.36d - Temporary Development, outlines the general procedures for estimating the costs of temporary roads. Temporary road cost estimates shall be based on the data and procedures contained in the current Cost Guide for road construction. The responsibility for the accuracy of temporary road cost estimates rests with Qualified Engineers as designated by the Regional Director of Engineering (FSM 7721.04c). Forest Supervisors are to ensure that a qualified engineer reviews all project cost estimates for the administrative unit (FSM 7721.04d).

The following procedure, or an estimate by time and equipment, should be used to develop temporary road costs. Sideslopes 0% through 20% consider a 12 ft roadbed and 30% through 50% consider a 14 ft roadbed to allow for cable logging. If time and equipment methods are used, labor rates and equipment rental rates for equipment 15 years and older contained in this Cost Guide should be used. Equipment rates need to be reduced by 6% to remove the profit. Labor rates need to be adjusted as described in the TIMBER SALE PURCHASER WAGE RATE ADJUSTMENTS. Section.

Step 1: Using Table 98. Basic Temporary Road Costs by Mile for Idaho or Table 99. Basic Temporary Road Costs by Mile for Montana, determine costs for clearing and grubbing based on side slope (SS %) and right-of-way volume per acre.

The cost of felling, bucking, and skidding the right-of-way timber on temporary roads is considered a logging cost and not a road cost.

If additional clearing width is desired for windrow placement, etc. make necessary cost allowance.

Step 2: Using Table 98. Basic Temporary Road Costs by Mile for Idaho or Table 99. Basic Temporary Road Costs by Mile for Montana, determine excavation cost per mile based on side slope (SS %) and right-of-way volume per acre.

If turnouts or turn-arounds are desired, adjust excavation costs accordingly.

Step 3: Using Table 98. Basic Temporary Road Costs by Mile for Idaho or Table 99. Basic Temporary Road Costs by Mile for Montana, determine seeding cost per mile based on side slope (SS %) and right-of-way volume per acre.

The costs of seeding include the road bed.

NOTE: seeding costs do not make allowances for native seed, if native seed is required, contact supplier for cost and availability.

Step 4: Determine the cost of obliteration using Table 101. Cost per Mile for Obliteration of Temporary Roads in Idaho and Montana.

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:

Dips: \$150 each

Culverts: Table 100. Costs for Culverts for Temporary Roads in Idaho and Montana

Step 8: Add the costs determined in Steps 6 & 7. Add the allowance for Mobilization for Temporary Roads.

Example Temporary Road Calculation:

Given:

Location: Idaho (Zone factor is not to be considered)
Average side slope: 30 percent
Estimated length: 1.5 miles
Timber volume: 40 CCF/acre
Drainage structures: 4 - 18" culverts, slope is 20%, 2 - 24" culverts, slope is 20%
Obliteration: Average scarification

Solution:

Step 1: Clearing and grubbing = \$6,710/mile

Step 2: Excavation = \$4,420/mile

Step 3: Seeding = \$1,570/mile

Step 4: Obliteration = \$1,800/mile

Step 5: (Step 1) + (Step 2) + (Step 3) + (Step 4) = \$14,500/mile

Step 6: \$14,500/mile x 1.5 miles = \$21,750

Step 7: Drainage structures:

$$4 \times \$630 = \$2520$$

$$2 \times \$705 = \$1410$$

$$\$2520 + 1410 = \$3930$$

Step 8: (Step 6) + (Step 7) = \$21,750 + \$3,930 = \$25,680

Mobilization = \$25,680 x 0.07 = \$1,800

Total = \$25,680 + \$1,800 = \$27,480

*No adjustments are made or are necessary for Zones, Construction Wage Rates, and Wage differentials. These adjustments are built in the Tables.

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

Table 98. Basic Temporary Road Costs by Mile for Idaho

Side Slopes%	R/W Vol CCF/Ac	Clearing R/W Timber to TS Purchaser	Excavation	Seeding 0% - 20% SS 12 ft roadbed; 30% - 50% SS 14 ft roadbed
0	0	\$4,480	\$900	\$980
10	0	\$4,480	\$900	\$980
20	0	\$4,880	\$1,800	\$1,180
30	0	\$6,510	\$4,420	\$1,570
40	0	\$7,930	\$8,070	\$1,920
50	0	\$10,520	\$11,380	\$2,310
0	10	\$4,530	\$900	\$980
10	10	\$4,530	\$900	\$980
20	10	\$4,930	\$1,800	\$1,180
30	10	\$6,560	\$4,420	\$1,570
40	10	\$7,980	\$8,070	\$1,920
50	10	\$10,570	\$11,380	\$2,310
0	20	\$4,580	\$900	\$980
10	20	\$4,580	\$900	\$980
20	20	\$4,980	\$1,800	\$1,180
30	20	\$6,610	\$4,420	\$1,570
40	20	\$8,030	\$8,070	\$1,920
50	20	\$10,620	\$11,380	\$2,310
0	30	\$4,630	\$900	\$980
10	30	\$4,630	\$900	\$980
20	30	\$5,030	\$1,800	\$1,180
30	30	\$6,660	\$4,420	\$1,570
40	30	\$8,080	\$8,070	\$1,920
50	30	\$10,670	\$11,380	\$2,310
0	40	\$4,680	\$900	\$980
10	40	\$4,680	\$900	\$980
20	40	\$5,080	\$1,800	\$1,180
30	40	\$6,710	\$4,420	\$1,570
40	40	\$8,130	\$8,070	\$1,920
50	40	\$10,720	\$11,380	\$2,310
0	50	\$4,730	\$900	\$980
10	50	\$4,730	\$900	\$980
20	50	\$5,130	\$1,800	\$1,180
30	50	\$6,760	\$4,420	\$1,570
40	50	\$8,180	\$8,070	\$1,920
50	50	\$10,770	\$11,380	\$2,310
0	60	\$4,780	\$900	\$980
10	60	\$4,780	\$900	\$980
20	60	\$5,180	\$1,800	\$1,180
30	60	\$6,810	\$4,420	\$1,570
40	60	\$8,230	\$8,070	\$1,920
50	60	\$10,820	\$11,380	\$2,310

Side Slopes%	R/W Vol CCF/Ac	Clearing R/W Timber to TS Purchaser	Excavation	Seeding 0% - 20% SS 12 ft roadbed; 30% - 50% SS 14 ft roadbed
0	70	\$4,830	\$900	\$980
10	70	\$4,830	\$900	\$980
20	70	\$5,230	\$1,800	\$1,180
30	70	\$6,860	\$4,420	\$1,570
40	70	\$8,280	\$8,070	\$1,920
50	70	\$10,870	\$11,380	\$2,310
0	80	\$4,880	\$900	\$980
10	80	\$4,880	\$900	\$980
20	80	\$5,280	\$1,800	\$1,180
30	80	\$6,910	\$4,420	\$1,570
40	80	\$8,330	\$8,070	\$1,920
50	80	\$10,920	\$11,380	\$2,310
0	90	\$4,930	\$900	\$980
10	90	\$4,930	\$900	\$980
20	90	\$5,330	\$1,800	\$1,180
30	90	\$6,960	\$4,420	\$1,570
40	90	\$8,380	\$8,070	\$1,920
50	90	\$10,970	\$11,380	\$2,310
0	100	\$4,980	\$900	\$980
10	100	\$4,980	\$900	\$980
20	100	\$5,380	\$1,800	\$1,180
30	100	\$7,010	\$4,420	\$1,570
40	100	\$8,430	\$8,070	\$1,920
50	100	\$11,020	\$11,380	\$2,310

Table 99. Basic Temporary Road Costs by Mile for Montana

Side Slopes%	R/W Vol CCF/Ac	Clearing R/W Timber to TS Purchaser	Excavation	Seeding 0% - 20% SS 12 ft roadbed; 30% - 50% SS 14 ft roadbed
0	0	\$4,550	\$930	\$1,030
10	0	\$4,550	\$930	\$1,030
20	0	\$4,970	\$1,860	\$1,230
30	0	\$6,620	\$4,580	\$1,650
40	0	\$8,070	\$8,380	\$2,010
50	0	\$10,700	\$11,810	\$2,420
0	10	\$4,600	\$930	\$1,030
10	10	\$4,600	\$930	\$1,030
20	10	\$5,020	\$1,860	\$1,230
30	10	\$6,670	\$4,580	\$1,650
40	10	\$8,120	\$8,380	\$2,010
50	10	\$10,750	\$11,810	\$2,420
0	20	\$4,650	\$930	\$1,030
10	20	\$4,650	\$930	\$1,030
20	20	\$5,070	\$1,860	\$1,230
30	20	\$6,720	\$4,580	\$1,650
40	20	\$8,170	\$8,380	\$2,010
50	20	\$10,800	\$11,810	\$2,420
0	30	\$4,700	\$930	\$1,030
10	30	\$4,700	\$930	\$1,030
20	30	\$5,120	\$1,860	\$1,230
30	30	\$6,770	\$4,580	\$1,650
40	30	\$8,220	\$8,380	\$2,010
50	30	\$10,850	\$11,810	\$2,420
0	40	\$4,750	\$930	\$1,030
10	40	\$4,750	\$930	\$1,030
20	40	\$5,170	\$1,860	\$1,230
30	40	\$6,820	\$4,580	\$1,650
40	40	\$8,270	\$8,380	\$2,010
50	40	\$10,900	\$11,810	\$2,420
0	50	\$4,800	\$930	\$1,030
10	50	\$4,800	\$930	\$1,030
20	50	\$5,220	\$1,860	\$1,230
30	50	\$6,870	\$4,580	\$1,650
40	50	\$8,320	\$8,380	\$2,010
50	50	\$10,950	\$11,810	\$2,420
0	60	\$4,850	\$930	\$1,030
10	60	\$4,850	\$930	\$1,030
20	60	\$5,270	\$1,860	\$1,230
30	60	\$6,920	\$4,580	\$1,650
40	60	\$8,370	\$8,380	\$2,010
50	60	\$11,000	\$11,810	\$2,420

Side Slopes%	R/W Vol CCF/Ac	Clearing R/W Timber to TS Purchaser	Excavation	Seeding 0% - 20% SS 12 ft roadbed; 30% - 50% SS 14 ft roadbed
0	70	\$4,900	\$930	\$1,030
10	70	\$4,900	\$930	\$1,030
20	70	\$5,320	\$1,860	\$1,230
30	70	\$6,970	\$4,580	\$1,650
40	70	\$8,420	\$8,380	\$2,010
50	70	\$11,050	\$11,810	\$2,420
0	80	\$4,950	\$930	\$1,030
10	80	\$4,950	\$930	\$1,030
20	80	\$5,370	\$1,860	\$1,230
30	80	\$7,020	\$4,580	\$1,650
40	80	\$8,470	\$8,380	\$2,010
50	80	\$11,100	\$11,810	\$2,420
0	90	\$5,000	\$930	\$1,030
10	90	\$5,000	\$930	\$1,030
20	90	\$5,420	\$1,860	\$1,230
30	90	\$7,070	\$4,580	\$1,650
40	90	\$8,520	\$8,380	\$2,010
50	90	\$11,150	\$11,810	\$2,420
0	100	\$5,050	\$930	\$1,030
10	100	\$5,050	\$930	\$1,030
20	100	\$5,470	\$1,860	\$1,230
30	100	\$7,120	\$4,580	\$1,650
40	100	\$8,570	\$8,380	\$2,010
50	100	\$11,200	\$11,810	\$2,420

Table 100. Costs for Culverts for Temporary Roads in Idaho and Montana

Side Slope %	Diameter (Inches)	Length (Feet)	Idaho \$/ft	Idaho \$/culvert	Montana \$/ft	Montana \$/culvert
0	18	20	\$21.83	\$440.00	\$21.90	\$440.00
10	18	26	\$21.85	\$570.00	\$21.92	\$570.00
20	18	28	\$22.46	\$630.00	\$22.54	\$635.00
30	18	32	\$23.18	\$745.00	\$23.27	\$745.00
40	18	52	\$23.92	\$1,245.00	\$24.01	\$1,250.00
50	18	60	\$24.71	\$1,485.00	\$24.82	\$1,490.00
60	18	80	\$27.03	\$2,165.00	\$27.16	\$2,175.00
0	24	20	\$24.47	\$490.00	\$24.52	\$495.00
10	24	26	\$24.52	\$640.00	\$24.58	\$640.00
20	24	28	\$25.04	\$705.00	\$25.10	\$705.00
30	24	32	\$25.72	\$825.00	\$25.79	\$830.00
40	24	52	\$26.49	\$1,380.00	\$26.57	\$1,385.00
50	24	60	\$27.35	\$1,645.00	\$27.44	\$1,650.00
60	24	80	\$29.67	\$2,375.00	\$29.79	\$2,385.00

Table 101. Cost per Mile for Obliteration of Temporary Roads in Idaho and Montana

Description	Terrain	Idaho	Montana
Surface scarification, outslope, revegetation	Gentle	\$525 - \$750	\$550 - \$750
Scarification, CMP removal, outslope, waterbars, rounding of backslopes and revegetation	Moderate	\$900 - \$2,200	\$900 - \$2,250
Scarification, CMP removal, outslope, waterbars, rounding of backslopes and revegetation	Steep	\$1,325 - \$2,800	\$1,350 - \$2,825
CMP removal, recontouring, and revegetation	Gentle	\$2,000 - \$3,900	\$2,025 - \$3,950
CMP removal, recontouring, and revegetation	Moderate to Steep	\$2,800 - \$5,575	\$2,825 - \$5,650

Note: Obliteration requirements are highly variable, ranging from surface scarification and water bar placement to complete recontouring and revegetation of the former roadway. Costs may increase due to difficult or unique conditions. Costs shown above based on small dozer, and excavator.

Mobilization for Temporary Roads

Mobilization is estimated as 7% of the total cost.

Cost Estimate Template for Temporary Roads

The following is an example form to be used when costing estimating 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, _____ 24" CMP

Note: Do not adjust project costs for inflation or deflation.

Step 1: Clearing and Grubbing (Table T-1) = \$ _____ /Mile (1)

Step 2: Excavation (Table T-1) = \$ _____ /Mile (2)

Step 3: Seeding (Table T-1) = \$ _____ /Mile (3)

Step 4: Obliteration (Table T-2) = \$ _____ /Mile (4)

Step 5: Total Unit Cost = (1)+(2)+(3)+(4) = \$ _____ /Mile (5)

Step 6: Basic Cost = Total (5) x Length = \$ _____ /Mile x _____ Mile(s) = \$ _____ (6)

Step 7: Drainage Structures

_____ Dips* x \$ _____ /Dip = \$ _____

_____ 18" CMPs x \$ _____ /CMP = \$ _____

_____ 24" CMPs x \$ _____ /CMP = \$ _____

Drainage Cost Total = \$ _____ (7)

Step 8: Subtotal = Basic Cost (6) + Drainage Cost (7) = \$ _____

Mobilization = Subtotal x Mobilization% = \$ _____ x _____ % = \$ _____

Subtotal + Mobilization = \$ _____ (8)

TOTAL = \$ _____ (8)

*Caution is advised on using Dips where logging and chip trucks, and lowboys are used – they need to be designed in a manner that prevents truck frames from flexing which can damage the truck's undercarriage and frame