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Department of  
Agriculture

Forest Service  
Intermountain  
Southwestern  
Rocky Mountain  
Regions  
Engineering



# Cost Estimating Guide for Road Construction

March 2012



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## Abbreviations

|                 |   |
|-----------------|---|
| °F              | Degrees Fahrenheit  |
| A/E             | Architectural and Engineering   |
| AQM             | Acquisition Management  |
| C               | Cut   |
| CIM             | Construction induced maintenance  |
| CL              | Centerline  |
| CMP             | Corrugated metal pipe   |
| CPI             | Consumer Price Index  |
| cy              | Cubic yard  |
| D               | Ditch   |
| D-B             | Davis-Bacon wage rates  |
| DD              | Drain dip   |
| DIA             | Diameter  |
| Ea              | Each  |
| F               | Fill  |
| FP-03           | Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects |
| FSSS            | Forest Service Supplemental Specifications  |
| ft              | Foot  |
| gal             | Gallon  |
| GVW             | Gross vehicular weight  |
| H               | Horizontal  |
| in              | Inch  |
| L               | L-line (final location line)  |
| lb              | Pound   |
| lbs             | Pounds  |
| LF              | Linear foot   |
| NFMA            | National Forest Management Act  |
| P               | P-line (preliminary location line)  |
| PAE             | Post award engineering  |
| PC              | Point of curvature  |
| PI              | Point of intersect  |
| PT              | Point of tangency   |
| QA              | Quality assurance   |
| QC              | Quality control   |
| RP              | Reference point   |
| SY              | Square yard   |
| TPH             | Tons per hour   |
| V               | Vertical  |
| W               | Width   |
| yd              | Yard  |
| yd <sup>2</sup> | Square yard   |
| yd <sup>3</sup> | Cubic yard  |

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## General Information

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

**Table 1 - Past CPIs**

| Year | CPI   |
|------|-------|
| 2011 | 3.0%  |
| 2010 | 1.5%  |
| 2009 | 2.7%  |
| 2008 | 0.01% |
| 2007 | 4.1%  |
| 2006 | 2.5%  |

Current CPI is available online from the US Bureau of Labor Statistics at:  
<http://www.bls.gov/cpi/>

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

### Significant Changes in the 2012 Cost Guide

Equipment costs were updated in 2012. Construction Materials Supplier contact information was verified and updated. All Supplier information was moved to the back of the guide. This section can easily be printed separately for easy reference. Current logging costs were not available at the time of publication for use in determining Temporary Road Construction costs. All units costs were pulled out of this version of the guide, except as shown in examples. Links to spreadsheets with detailed time and equipment estimating tools are included and may be utilized as a starting point for project time and equipment estimating. Equipment rates have been updated using 2011/2012 Means.

All units costs were pulled out of this version of the guide, except as shown in examples. Links to spreadsheets with detailed time and equipment estimating tools are included and may be utilized as a starting point for project time and equipment estimating (<http://fsweb.r4.fs.fed.us/unit/eng/transportation/scenarios/index.shtml> ). Equipment rates have been updated using 2012 RSMeans Heavy Construction Cost Data and 2011/2012 Rental Rate Blue Book.

The layout of the guide has changed. Previous versions of the Guide addressed both Public Works and Timber Sale estimating throughout each section. This 2012 version addresses only Public Works estimates in the main sections, and adds a new section for Timber Sale adjustments. This is an attempt to make the estimating process more linear.

Instead of printing all Davis–Bacon Rates for every county in all three regions, units are encouraged to download the appropriate county rates annually and attach them to this guide. The Davis–Bacon wage rate determination section was expanded to better describe the process for determining and downloading the rates for each project.

Instructions for Clearing and Grubbing (Section 201&202) have been revised. There are very few local logging rates available to update the logging costs, and the most recent unit costs were almost 4 years old. No attempt was made to update the actual unit costs, instead more specific guidelines for time and equipment estimating are included. If available, current local logging costs may be used.

## Revisions and Updates

There is one annual revision of the Cost Guide that is typically published in February.

## Section Numbers

The section numbers are in accordance with the FP-03 Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects and Forest Service Supplemental Specifications (FSSS) (located in Spec Manager) so that the specifications will conform to the Forest Service contract requirements. Since the FSSS are being modified over time, unit costs shown in this guide may not accurately reflect the work required

<http://wodata01.fs.fed.us/fsfiles/unit/r4/fp03.nsf>. The FP-03 is available online at

<http://filh.fhwa.dot.gov/resources/pse/specs/>.

Verify that cost estimates allow for all work required by the various FSSS in the contract.

## Time and Equipment (Construction) Estimates

When making time and equipment estimates, be sure to include allowances for:

1. Supervision - On very small jobs this may be provided by an operator/supervisor at essentially no additional cost.
2. Taxes on the Purchase of Material- Also, allow for delivery cost to job site.
3. Bonding Cost - Bonding may be included in Section 151 Mobilization.
4. Stand By Time - "Standby time" Blue Book recommends 41%
5. Support Equipment - Fuel trucks, pickups, crew tran.
6. Permits - Even though permits are not a direct billed item, the cost of obtaining necessary permits is included in overhead.

## Unit Costs

The estimator should round off the unit price to avoid creating accounting errors when processing contract payments. For example, clearing costs generally should be rounded to the nearest \$10 per acre, excavation costs should be rounded to the nearest \$.25 per CY, and CMP costs are rounded to \$.50/LF. Quantities should generally be rounded no further than the nearest one-tenth (0.1), depending on accuracy of measurements and cost or value of the item.

## Use of Average Cost in Project

Use average cost for individual roads within the project whenever possible unless there are significant variations in the character of work from one road to another. Variations are sometimes appropriate for clearing, excavation, hauling, or other unique situations. In these situations, each road should have separate and distinct unit costs for those items; otherwise, the use of overall project unit costs may create problems with design changes, alternate facilities, etc.

## Profit and Risk Factor

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

## Pay Item Number

Pay item numbers and descriptions are found in the Spec Manager database rather than in the FP-03 book.

### **Public Works and Timber Sale Estimates**

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

### **Fuel Prices**

Due to variable fuel costs estimators should adjust equipment rates (Section 622) to account for these variations. These equipment rates are based prior year data and should adjusted if fuel prices varied substantially (+/-).

### **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**

For small quantities verify costs with local suppliers.

### **Purchaser Engineering**

Recent changes in forest road program budgets have introduced or revised several concepts for timber sale roads. Estimators should refer to specific C-provision requirements when estimating purchaser engineering costs.

### **Contract Modifications and Design Changes**

The principles, costs, etc. listed in this Guide can be used to assist in determining unit costs for contract modifications and change orders; however, site specific and project related information should be used to the maximum extent possible.

### **Electronic Copy of the Cost Guide**

The 2010 R2/R3/R4 Cost Guide is available for downloading by employees and the general public at [http://www.fs.fed.us/r4/projects/roads/cost\\_est\\_guide.pdf](http://www.fs.fed.us/r4/projects/roads/cost_est_guide.pdf).

Summary - This is only a guide and should be adjusted by the estimator using engineering judgment and prior knowledge of the specific project and local conditions when preparing cost estimates.

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

- RS Means Heavy Construction Cost Data Contact
- Equipment Watch Rental Rate Blue Book for Construction Equipment
- <http://www.cat.com/equipment> - for production rates and equipment capabilities
- (For above references Regional Construction Specialist)

### **Public Works Determination of Wage Rates**

Current Davis-Bacon wage rates may be downloaded at <http://www.wdol.gov/dba.aspx>.

Instructions DOL website: Select your state, scroll to county where the project will be located, click on the "Heavy" for construction type, Davis Bacon wage decisions will be displayed for this location. It is recommended that units print current wage determinations for the counties in which they work.

Multiply the Davis Bacon Wage Rate by the appropriate State Overhead Adjustment Factor in the table below. These factors account for overhead costs such as profit and risk, FICA, and unemployment insurance.

**Davis Bacon State Overhead Adjustment Factors**

| State | Factor | State | Factor | State | Factor | State | Factor |
|-------|--------|-------|--------|-------|--------|-------|--------|
| AZ    | 1.44   | ID    | 1.47   | NM    | 1.48   | SD    | 1.50   |
| CA    | 1.58   | KS    | 1.46   | NV    | 1.48   | UT    | 1.49   |
| CO    | 1.47   | NE    | 1.55   | WY    | 1.47   |       |        |

# Public Works Road Construction Costing

## General Note

If specialized pieces of equipment or machines are required, the percentage should be increased. If the time and equipment method is used calculate mobilization, make allowances for obtaining permits, insurance, bonds, and moving personnel and materials to the job site (maybe applicable to all sections below).

## Construction Induced Maintenance (CIM)

Payment for CIM can be made in several ways, depending on the situation. CIM should be included in and made a requirement of the contract, public works or timber sale. When CIM is required to support a specific construction activity, payment and the cost estimate should be subsidiary to that item (see FSH 7709.56, Sec 74.2). Maintenance of haul or traffic control routes are examples of this.

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

## Example Scenarios for Calculating bid Items

The spreadsheets containing example scenarios can be found at <http://fsweb.r4.fs.fed.us/unit/eng/transportation/scenarios/index.shtml>

## Section 151 – Mobilization (Labor 30-60%)

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

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

**Table 2 - Average Mobilization Percentages**

| Total Project Cost |             | Mobilization Costs of Project |
|--------------------|-------------|-------------------------------|
| Low                | High        |                               |
| \$50,000           | \$600,000   | 9%                            |
| \$600,000          | \$899,999   | 8%                            |
| \$900,000          | \$1,999,999 | 7%                            |
| \$1,200,000        | over        | 6%                            |

These percentages consider a normal project to have two construction seasons.

Example - Simple Mobilization

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

Mobilization Costs = \$110,000 x .09 (reference Table 2) = \$9,900

## Section 152 Construction Survey and Staking (Contract Item)

### Road Location

This item will be included in overhead for timber sales.

### Construction Surveys

Detailed surveys of existing roads generally run higher than new construction due to the presence of cut/fill slopes, culverts, and other features.

Survey costs for an engineering firm should be estimated using the recent contract costs if known. An 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. Additional fieldwork may include items such as material and clearing classification, special site investigation, and stream flow estimates. Survey parties vary from two to three people depending on the equipment used and the complexity of the survey. The following production rates should be used as a guide in estimating fieldwork:

1. Brushing - Three-person crew - The production for brushing is dependent upon density of stems and will vary with the requirements of the contract:
2. P-Line Survey - Estimate P-Line survey costs in Section 183.
3. Traverse - Three-person crew - The production for traverse is dependent upon the precision of survey and number of points of intersection (PI's) per mile. The estimator should base the cost on the breakdown of the desired precision. It is 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.
4. Levels: Two-person crew - Estimate according to the precision of the survey.
5. Cross Sections - Three-person crew. Estimate according to the precision of the survey.
6. Supervision - supervisor surveyor.
7. Mobilization - Allow move-in/move-out costs, supplies, and transportation.
8. Checking Notes-Office Work - All notes need to be office checked for completeness. Traverse and level notes need office work in recording and computation for angles and elevation. There is no per diem allowance for this work. Allow 1 to 2 hours per mile for one person.

**Table 3 - Survey Crew Production Rates**

| Density of stems | Miles per day |
|------------------|---------------|
| Extra heavy      | 0.35          |
| Heavy            | 0.5           |
| Medium           | 0.7           |
| Light            | 1.0           |
| Extra light      | 1.5           |

**Table 4 - PI Survey Crew Production Rates**

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

For survey precision standards see the Survey Accuracy Standard, FSH 7709.56

**Table 5 - Level Survey Crew Production Rates**

| Accuracy Standard | Miles per day |
|-------------------|---------------|
| A, B              | 0.5           |
| C,D               | 0.7           |
| E, F              | 1.0           |

**Table 6 - Cross Section Survey Crew Production Rates**

| Slope     | Miles per day |
|-----------|---------------|
| 50% +     | 0.4           |
| 30 to 50% | 0.6           |
| 0 to 30%  | 0.7           |

**Site Surveys**

Utilize two surveyors and the hours needed based on the size of the location and complexity (Includes setting control, topographic data collection, and plotting site plan).

**Corner Search, Monumenting, and Boundary Marking and Posting**

Contact the Forest Land Survey staff for costs associated with this type of work.

**Construction Staking**

Construction staking is usually accomplished by either Method I - Computed Method or Method II - Catch-point Measurement Method.

Method I - Computed Method - With this method the surveyors use the template information shown in the slope stake notes to calculate the actual location of the catch-point. The slope stake "catch-point distance" shown in the stake notes may be used as a trial location to initiate slope staking. Add an additional 30 minutes labor time for staking culverts and other features. Average base prices should be multiplied by the following factors to determine final unit cost.

**Method I Factor Multipliers**

|                             |      |
|-----------------------------|------|
| Slope Staking – one side:   | 0.85 |
| Slope Staking – both sides: | 1.0  |
| Side Slopes – 0 to 30%      | 1.0  |
| Side Slopes – 50% and over  | 1.25 |
| Brush Density – light:      | 1.0  |
| Brush Density – heavy:      | 1.33 |

Method II – Catch-point Measurement Method - With this method the surveyors locate slope stake catch-points and clearing limits by measuring the “catch-point distance” shown in the slope stake notes. The base cost should be calculated using a 3 person crew, completing 0.5 miles per day, 120 points per mile, staking cut and fill catch-points, and setting one RP stake per side. Estimates should include costs for stakes, paint, markers, flagging, travel, and per diem.

### Section 153 - Contractor Quality Control

Incidental to construction cost

### Section 154 - Contractor Sampling and Testing

There are four aspects of contractor sampling and testing:

1. Certificates of compliance
2. Field and laboratory quality control sampling and testing
3. Field measurements
4. Records of quality control sampling, testing, and measuring

### Sampling and Testing

The following sampling and testing costs are from Central Federal Lands FHWA as of February 2011.

**Table 7 - Materials Testing and Inspection Costs**

|   | Unit     | Price    |
|---|----------|----------|
| ---SOILS INSPECTION and TESTING                         |          |          |
| Field Density Testing D2922                             | Hour     | \$55.00  |
| Proctor D698, D1557/T99, T180                           | Each     | \$175.00 |
| Sieve Analysis- Coarse and Fine C117, C136/T11, T27     | Each     | \$155.00 |
| Atterberg Limits D4318/T89, T90 (LL PL)                 | Each     | \$100.00 |
| Sample Prep (Pick Up)                                   | Hours    | \$30.00  |
| Subgrade Inspector/Geologist                            | Hours    | \$80.00  |
| ---CONCRETE INSPECTION and TESTING                      |          |          |
| Concrete Inspector                                      |          |          |
| Epoxy Bolt/Dowel Inspector                              | Hours    | \$50.00  |
| Rebar, Tensile Strength AASHTO M31, ASTM A615           | Each     | \$195.00 |
| Concrete Cylinders C39/T22 (Compression Test)           | Each     | \$31.00  |
| Cylinders Pick Up & Sample Prep                         | Hours    | \$30.00  |
| ---MASONRY INSPECTION and TESTING                       |          |          |
| Masonry Inspector                                       | Hours    | \$50.00  |
| Mortar Cylinders Strength C109/T106                     | set of 3 | \$50.00  |
| Grout Prisms C1019                                      | set of 4 | \$60.00  |
| CMU Compressive Strength (Prisms) (Grouted) C1314       | set of 3 | \$230.00 |
| CMU Compressive Strength (Block Only) C140              | set of 3 | \$75.00  |
| CMU Absorption, Density and Moisture C140               | set of 3 | \$90.00  |
| ---ASPHALT INSPECTION and TESTING                       |          |          |
| Asphalt Field Density Testing D2922                     | Hours    | \$55.00  |
| Asphalt Coring D979                                     | Hours    | \$125.00 |
| Asphalt Core Specific Gravity, Height, Diameter, Weight | Each     | \$150.00 |
| Asphalt Content-by Ignition Method D6307/T308           | Each     | \$140.00 |
| Mechanical Analysis D5444                               | Each     | \$100.00 |
| ---MISCELLANEOUS ITEMS                                  |          |          |

| ---SOILS INSPECTION and TESTING             | Unit  | Price      |
|---|-------|------------|
| Professional Engineer                       | Hours | \$150.00   |
| Per Diem                                    | Day   | \$100.00   |
| Mobile Laboratory                           | Month | \$2,200.00 |
| Sample Preparation (unless otherwise noted) | Each  | \$30.00    |
| Test Report Preparation                     | Each  | \$38.50    |

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

### **Section 156 - Public Traffic**

Generally the cost of temporary traffic control is approximately 3% - 5% of the total construction cost depending on complexity and traffic volumes. If ADT's are over 250 consult local traffic control contractors or state DOT for estimated traffic control costs.

### **Section 157 - Soil Erosion Control**

This work consists of temporary and permanent measures incorporated into the project to reduce and control soil erosion and water pollution. Measures taken may be in areas that in the past have been considered "normal practice", i.e., waterbars or rolling dips constructed on roads during construction, or they may be items that have been designed specifically for erosion control.

Costs may be estimated directly under Section 157 and shown on the Schedule of Items or may be subsidiary to other pay items, some examples are as follows:

1. 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.
2. Section 157.09 Diversions, Earth Berms - The purpose of the berm is for a reduction of erosion.
3. Section 157.11 Temporary Turf Establishment - This work is accomplished solely for the purpose of erosion control. The cost of this work is directly related to Section 157. This cost should not be considered under Section 625.

If the primary purpose of the windrow is slash disposal, this work should be paid under section 201 and/or 203. However, if the work is for erosion control then it should be paid under section 157.

### **Cost Estimating Guidelines**

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

Example scenarios calculating the following items can be found on <http://fsweb.r4.fs.fed.us/unit/eng/transportation/scenarios/index.shtml>

**Table 8 - Soil Erosion and Water Pollution Control Work**

| Description of Work   | Pay Unit | Percent Labor |
|---|----------|---------------|
| Temp Seeding and Fertilizing<br>Seed at 30 lb/acre, seed and fertilizer in one application<br>Fertilizer at 200 lb/acre   | acre     | 20-40%        |
| Dry Mulching (Weed Free Straw)<br>Seed at 30 lb/acre<br>Fertilizer at 200 lb/acre<br>Straw at 2 tons/acre   | acre     | 30-40%        |
| Hydromulching<br>Seed at 40 lb/acre<br>Fertilizer at 200 lb/acre<br>J-TACK H-S at 120-160 lb/acr<br>Wood Cellulose Fiber at 150-300 lb/acre<br>Hay or Straw at 2 tons/acre<br>Water as Necessary  | acre     | 20-50%        |
| Temporary Netting (4'x10' sheet)<br>Should price using specific Material / Labor, etc   | each     | 60-70%        |
| Straw/Hay Bales (Weed free required)<br>Bales placed by hand below CMP's prior to installation at live water; also used below outlet of cross-drains in highly erosive soil areas and in ditches. | each     | 35-50%        |
| Gravel Blanket<br>Sheathing   | cy       |               |
| Silt Fence<br>3 ft. high, includes wood stakes  | lf       | 50-60%        |
| Earth Berm  | each     | 30%           |
| Dam   | each     |               |
| Drain Dips<br>Equipment - D7 w/ operator and Cat 12H w/ operator  | each     | 25%           |

**Section 170 - Develop Water Supply and Watering (Labor 50-70%)****Estimated Quantity**

For embankment construction, estimate 5-10 gallons/cy. For base and surface courses, estimate 35-44 gallons/cy of aggregate or 20-25 gallons/ton of aggregate.

**Total Cost**

Water costs are generally incidental to the aggregate/compaction item. Watering cost includes installing either a pump or gravity system to fill the tanker, filling time, and haul. If any other work is required such as digging a basin, constructing a large check dam or constructing a spur road, compute these costs by using time and equipment methods.

### **Haul Costs**

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

### **General**

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.

### **Section 183 - P Line Survey**

P-Line costs are generally dependent on survey standards, project access (drive, walk, camp, etc), terrain, vegetation density and time schedule. Survey parties vary from two to three people depending on the equipment used and the complexity of the survey. Survey costs for engineering firms negotiated survey and design contracts should be estimated using the recent contract costs if known. Use the production rates in Table 9 as a guide in estimating fieldwork.

### **P-Line Survey**

Three-person crew. This work includes collection of traverse and cross section data needed for low volume road design. The production for P-line survey is dependent upon the precision of survey and number of points of intersection (PI's) per mile, and the width of the cross-section swath. For average conditions consider a production rate of a 0.5 mile/day of completed work. Costs for completed surveys include supplies (stakes, paint, flagging, etc.), and travel expenses (per diem, mileage, etc.) based on easy terrain and minimal brush.

**Table 9 - P-Line Survey Production Rates**

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

When estimating P-Line Surveying, include the following:

1. Supervision (See Section 152 for unit costs)
2. Mobilization (See Section 152 for unit costs)
3. Checking Notes-Office Work (See Section 152 for unit costs)

### **Section 185 - Low Volume Road Design**

Road design includes classification, plan and profile, cross sections, and plan-in-hand reviews.

## **Section 201 - Clearing and Grubbing (Labor 40-55%) & Section 202 - Additional Clearing and Grubbing**

### **General**

Develop time and equipment scenarios that are applicable to the project. Generally equipment utilized in clearing and grubbing are the following: excavator, chainsaw, and pickup truck; and in medium and heavy clearing a dozer can be utilized. The following process can be followed to determine clearing and grubbing costs:

1. Determine the classification of stand description
2. Develop a scenario based on the stand description
3. Use the appropriate topographic factor in Table 12
4. To account for slash and cleanup utilize Table 13 and 14 as needed

### **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 by the guidelines below. Additional items to be considered are the amount and size of down material and the size of stumps and limbs.

Another way to determine stand classification is to coordinate with the vegetation management personnel to utilize Figure 1. Adjustments may be needed if the project is for an existing roadbed. In some cases the down volume is insignificant while in others it may be more difficult to handle than standing volume. Therefore, an adjustment factor for down material of 0 to 1.2 is appropriate.

1. EXTRA LIGHT: Few tops and limbs. Few, if any, cull logs. Low scattered brush. Little or no falling or yarding of unmerchantable timber required.
2. LIGHT: Light to moderate amount of tops and limbs. Few cull logs. Light brush. Little to moderate falling or skidding of unmerchantable required.
3. 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.
4. 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.
5. 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.

### **Clearing Costs for New Construction**

Estimate clearing costs for new road construction using per acre costs. Use production rates in Table 10. If possible, use local logging costs when available. Estimate time and equipment for an excavator, 2 chain saws and a pick-up truck.

**Table 10 Estimated Clearing Production Rates for New Road Construction**

| Type of Clearing | Unit | Production Rate |
|------------------|------|-----------------|
| Extra light      | Acre | 5-7 hours       |
| Light            | Acre | 7-10 hours      |
| Medium           | Acre | 11-16 hours     |
| Heavy            | Acre | 15-20 hours     |
| Extra Heavy      | Acre | 20-28 hours     |

**Clearing Costs for Reconstruction**

Estimate clearing costs for reconstruction using per mile costs. Production rates for reconstruction are in Table 10. Estimate time and equipment for an excavator, 2 chain saws and a pick-up truck.

**Table 11 - Estimated Clearing Production Rate for Reconstruction of Existing Roads**

| Type of Clearing    | Unit | Approximate Time |
|---------------------|------|------------------|
| Single Tree         | Each | 20 min.          |
| Clear Tree w/ Slash | Each | 30 min.          |
| Extra Light         | Mile | 1 – 3 hr.        |
| Light               | Mile | 3 – 5 hr.        |
| Medium              | Mile | 5 – 7 hr.        |
| Heavy               | Mile | 7 – 11 hr.       |
| Extra Heavy         | Mile | 11 - 20 hr.      |

**Topographic Factor**

The cost-per-acre figures should be adjusted by the following topographic factors in Table 11

**Table 12 - Clearing and Grubbing Topographic Factors**

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

**Slash/Cleanup Factor**

The cost-per-acre figures must also be adjusted by the slash cleanup factor if the required treatment method is other than windrowing. 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 13 - Clearing and Grubbing Slash/Cleanup Factors**

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

Different treatment methods may be specified for Tops and Limbs, Logs, and Stumps. When this occurs, the following slash treatment combinations should be used to prorate costs based on the treatment method specified for each type of slash. Adjustments can be made as specified by the Timber Contracting Officer.

**Table 14 - Slash Treatment Combinations**

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

Example - Slash/Clean Up Factor

Treatment Methods:

Tops and Limbs - Pile and Burn

Logs - Windrow

Stumps - Scatter

Adjusted Slash Treatment Factor

Tops and Limbs  $(0.35) \times (1.6) = 0.56$

Logs  $(0.35) \times (1.00) = 0.35$

Stumps  $(0.30) \times (1.15) = 0.345$

Total Factor =  $0.56 + 0.35 + 0.345 = 1.25$

Other: Additional areas and/or strips may need to be cleared, but not grubbed, for burning bays, decking areas, and for windrowing right-of-way slash in dense lodgepole pine stands. The cost allowances for these situations should consider the treatment of tops and limbs, and logs, but not stumps. Clearing costs associated with campgrounds will normally be higher. Cost allowance for painting and branding of logs, where required, is considered incidental to the clearing cost estimate, no separate allowance is generally required.

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

This includes falling and windrowing the slash of hazard trees that lie outside of the clearing limits. Average cost: \$175 per tree. Cost to fall and leave snags outside of clearing limits equals \$30 (+/-) each.

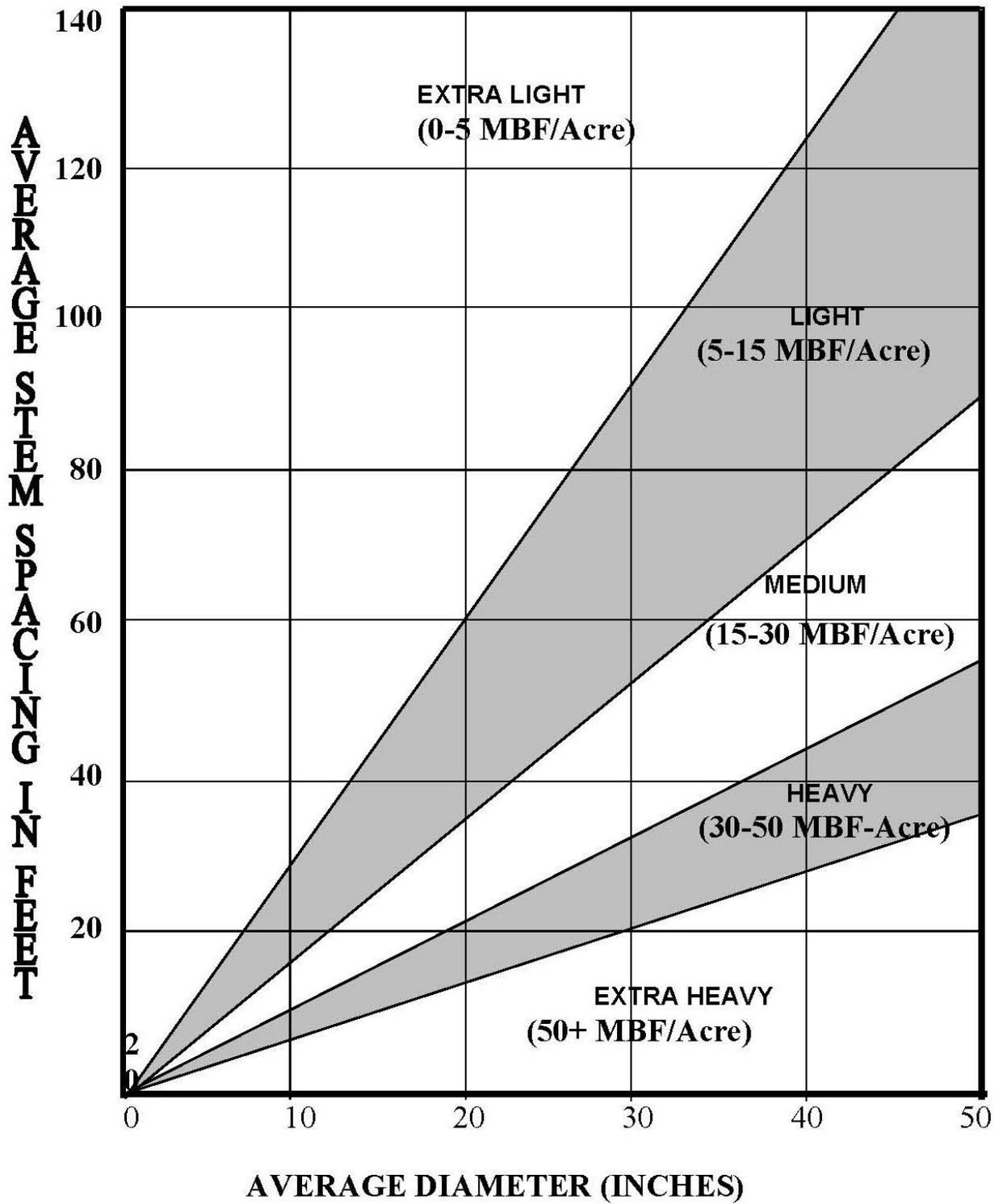


Figure 1 - Equivalent Volume using Average Diameters and Stem Spacing

## Section 203 - Removal of Structures and Obstructions (Labor 50-60%)

### General

In addition to the costs listed below 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.

### Removal of Existing Bridges

This item should be estimated on an individual basis. Use time and equipment to compute the cost. Typical structures are:

1. Treated Timber Bridges: Cost is dependent on abutment height and span. Normally treated timber members require disposal at a certified site, this will generally incur additional expense.
2. Native Log Bridge: Are sometimes disposed adjacent to the site.

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

### Removal and Stockpiling/Disposing of Cattle-guards

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. Unusable cattle-guards generally become the property of the contractor. Use time and equipment to compute the cost (see Appendix A: Equipment Rates and Public Works Determination of Wage Rates). Make allowance for filling in the hole resulting from the removal.

### Removal and Disposal of Pipe Culverts

This should be estimated using time and equipment. Consideration should be given to the salvage value and disposal method of the culvert. Unusable culverts generally become the property of the contractor. Also consider if the culvert is being replaced at the same location.

## Section 204 - Excavation and Embankment (Labor 20-45%)

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

**Table 15 - Excavation and Embankment Adjustment Factors**

| 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  |

**Base costs are to be adjusted by following:**

**Compaction Factor:**

|  |        |
|--|--------|
| *Compaction Methods from complete WO FSSS 204            | Factor |
| Method A(1) - More than 80% retained on a No.4 Sieve     | 1.60   |
| Method A(2) - 50% to 80% retained on a No.4 Sieve        | 1.70   |
| Method A(3) - Less than 50% retained on a No. 4 Sieve    | 1.90   |
| Method B - Roller Compaction - min. 3 passes             | 1.25   |
| Method C - Compaction by Hauling and Spreading Equipment | 1.40   |

\*Depending on the water content of the material an allowance may be needed for additional water.

**Benching Fill Slopes adjustments:** Assuming work is performed with a D-7 dozer

| Slope  | Production Rate |
|--------|-----------------|
| 30-50% | 3hr per 500 LF  |
| >50%   | 5hr per 500 LF  |

**Scarifying adjustments:** Costs include grader, laborer, and pickup.

| Type    | Rate         |
|---------|--------------|
| Light   | 3 hours/mile |
| Average | 4 hours/mile |
| Heavy   | 6 hours/mile |

**Shaping and Finishing adjustments:**

Make additional allowance for watering if needed.

**Table 16 - Shaping and Finishing Production Rates/Mile of Single Lane Roads with Ditch**

| Tolerance Class | A  | B/C | D/E | F/G/H | I/J/K/L/M |
|-----------------|----|-----|-----|-------|-----------|
| Rate (hrs/mi)   | 28 | 18  | 8   | 6     | 4         |

**Table 17 - Shaping and Finishing Production Rates/Mile of Single Lane Roads without Ditch**

| Tolerance Class | A  | B/C | D/E | F/G/H | I/J/K/L/M |
|-----------------|----|-----|-----|-------|-----------|
| Rate (hrs/mi)   | 16 | 10  | 6   | 4     | 2         |

For Double Lane, multiply single lane cost by 1.35.

**Table 18 - Loading Material into Trucks Factors:**

| Rock Type                       | Factor |
|---------------------------------|--------|
| Common and loose rock           | 1.45   |
| Stockpiles                      | 1.45   |
| Ripped rock                     | 1.60   |
| Blasted rock and large boulders | 2.25   |

**Conservation of Rock Factor:**

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

- **Example:** Push Distance →  $\frac{150 \text{ Feet}}{4.65}$                        $\frac{300 \text{ Feet}}{5.10}$

**Haul:** Haul should be calculated by Time and Equipment methods.

**Conservation of Topsoil Factor:**

Assume 3" layer of topsoil, 14 feet wide

- a. Stripping topsoil and windrowing with grader, relatively flat ground: 1.60
- a. Stripping topsoil with tracked loader and placing in stockpile within 300 ft.: 2.50

**Traffic Control** - see section 156.

**Water** - Estimate under Section 170 (see Complete WO FSSS 170), or include an allowance under this item.

**Pit Development** - Estimate under Section 651 (see Complete WO FSSS 651).

**Rounding Cut Slopes** - This work, if specified, applies to sophisticated "rounding" after initial pioneering and excavation, and not to blending of the cutslope with the natural ground during initial excavation which is done by a hydraulic excavator.

**Drainage Excavation and Furrow Ditches** - Drainage excavation can be estimated most easily by the lineal foot. The same piece of equipment is required for small quantities or larger amounts; but one may use something less efficient for very small amounts.

**Drainage Dips** - Drainage dips on reconstruction can be depending on difficulty of excavation. If armoring of dips is desired, make an allowance for the work incidental to the installation of the dip or include the appropriate aggregate item.

**Earth Berms** - Estimate according to time, equipment, and production rates for excavation/embankment.

**Haul (30-40% labor)**

This is generally not a pay item, costs are incidental to and included in other items of work. Haul of material includes the fixed costs (for the truck only) of spotting, loading, dumping, and turnaround in addition to the variable "underway" cost while hauling equipment is moving. Loading costs for the loading labor and equipment should be included under the parent specification for that work. The cost of hauling has several contributing factors:

- Length of haul
- Cost of fuel
- Terrain/grades/road conditions
- Number of haul units/efficiency

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 shrink/swell adjustment factor must be made to provide costs based on excavated cubic yards.

$$\text{Shrink/swell} = \frac{\text{in place density}}{\text{loose density}}$$

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

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

### Example - Haul Costs

| <u>Road Segment or Number</u> | <u>Avg. Speed Roundtrip</u> | <u>Length in Miles (one way)</u> | <u>Variable Cost (\$/cy - Mile)</u> | <u>Cubic Yards Hauled</u> | <u>Total Variable Cost(\$)</u> |
|-------------------------------|-----------------------------|----------------------------------|-------------------------------------|---------------------------|--------------------------------|
| 333                           | 25                          | 10.5                             | \$0.84                              | 550                       | X                              |

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

Using 12 cy End Dumps; 10 miles x \$1/cy-Mile x 550 cy = \$5,500

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

Using 12 cy End Dumps; \$2/cy x 550 cy = \$1,100

The total haul cost is the sum of the variable costs and fixed cost = \$5,500 + \$1,100 = \$6,600

### Section 208 - Structure Excavation and Backfill for Selected Major Structures (Labor 40%)

Costs vary on a case by case basis, and should be estimated using time and equipment rates.

### Section 211 - Roadway Obliteration (Labor 20-35%)

Due to the variance in complexity to obliterate a road, time and equipment methods should be used, and production rates should be site specific to the roadway to be obliterated. The following are examples for:

1. Roadbeds that are just to be out-sloped, production rates are 4-6 hours per mile with a D-7 dozer.
2. Light scarifying with a grader production rates are generally 3-4 hours per mile.
3. Ripping 6 - 12 inches with a dozer (one complete pass out and back), production rates are generally 3-4 hours per mile.
4. Removal of shallow installed cross drain culverts, allow 1-2 hours per removal with an excavator, depending upon fill height.

5. Culverts with higher fills, or in live streams, cost out by time and equipment methods. In addition, make cost allowances for stream diversions, additional clearing required to remove culvert, and slash disposal.
6. Non-drivable water bars, use a rate of 10 per hour with a D-7 Dozer.
7. Full re-contour, a D-7 dozer and excavator working together is typically used. Typical production rates range from 200 LF per hour for low to moderate side-slopes (10-30%) to 100 LF per hour for steeper side-slopes (>30%). In order to recover the entire fill embankment additional clearing may be required to reach the toe of fill.

Blocking access to a road may be accomplished by a gate, Jersey Barriers, boulders, or other means. **Follow the Forest Travel Management policy for blocking access and consider signs if appropriate.** Cost out the work by time and equipment methods. Other requirements may include seed, mulch, and fertilizer. Contact your local Range Conservationist to determine appropriate seed mix, mulch type, and fertilizer to apply, as well as the recommended application rates, and season.

### **Section 212 - Linear Grading (Labor 40%)**

This section is intended for use on single purpose roads in relatively gentle/moderate and uniform terrain. The specification combines clearing and grubbing, excavation, and erosion control. Use of this specification is NOT appropriate for sections that do not balance.

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 Table 19 through Table 22 on the following pages is appropriate and fits the intent of the specification. The tables are for roads without a ditch. The assumptions listed below were used in preparing the tables:

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

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

- Step 1:** Determine which quantity table to use based on road width and backslopes. Determine excavation quantity in cubic yards per mile using the existing average sideslope and applicable compaction factor. Multiply the cy per mile by the length of the road segment in miles to get the total excavation. Obtain the base excavation cost from Section 204. Adjust the excavation cost for materials, topography, and additional widening by multiplying the base excavation cost by the respective adjustment factors. Add additional cost for scarifying (if necessary), drainage dips, haul, etc.

Material Factor = (% Common)(1.0) + (%Loose Rock)(1.5 to 1.75) +  
 (% Rip)(3.0) + (% Blast and Boulders)(5.0)

Topography Factor = Self balanced sections = 1.0  
 Some through fills and free haul = 1.25

Widening Factor = No additional widening = 1.0

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

|            | Cubic Yards |             |
|------------|-------------|-------------|
| Sideslopes | Turnouts    | Turnarounds |
| 20%        | 31          | 62          |
| 40%        | 86          | 172         |
| 60%        | 223         | 446         |

Drainage Dips: See Section 204 for costs

Total Excavation Cost = (Base Cost) x (Material Factor) x (Topography Factor) x  
 (Widening Factor) + (Drainage Dips) + (Haul)

**Step 2:** Determine Clearing and Grubbing quantity in acres per mile by using the existing average sideslope. (Note: the minimum clearing width is 24 feet or 3 acres per mile.) Multiply the Acres per mile by the length of the road segment in miles to get the total clearing acres. The acres per mile in the tables are based upon a clearing limit of 10 feet beyond the toe of fill to allow room for windrow construction. If the additional clearing area is NOT required, reduce the clearing acres by 10 ft x 5280 ft / 43560 sf/acre = 1.2 Acres per mile for sideslopes above 30%. Obtain the base clearing cost per acre from Section 201 for the applicable clearing classification. Adjust the clearing cost by multiplying the base clearing and grubbing cost by the slash disposal adjustment and the widening factors.

Slash Disposals Factors:

|            |           |
|------------|-----------|
| Windrowing | 1.0-1.1   |
| Scattering | 1.15-1.35 |
| Piling     | 1.3       |

Widening Factors:

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

**Step 3:** Determine the Seeding quantity in acres per mile by estimating using the existing average sideslope. Multiply the Acres per mile by the length of the road segment in miles to get the total seeding acres. No seeding is applied to ¾:1 slopes as seed and mulch will not stay in place. Obtain the costs for the seed/mulch/fertilizer application from Section 625.

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

Example - Linear Grading Construction

Linear Grading Cost

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

Template: 14 ft w/o ditch, 3/4:1 backslope, self balanced sections, no through fills or free haul. Allow for turnouts every 1,000 feet, normal curve widening, one turnaround per mile, and 4 drainage dips. Seed, dry method, without mulch.

**Example Calculations:**

|   |
|---|
| <p><b>Step 1:</b> Base excavation cost = \$1.66 per cy<br/>                 Cubic Yards = 2353 cy/mile x 1.7 miles = 4,000 cy<br/>                 Adjusted excavation cost:<br/>                 Material Factor = (0.85 x 1.0) + (0.15 x 3.0) + (0 x 5.0) = 1.3<br/>                 Topography Factor = 1.0<br/>                 Widening Factor = 1.15<br/>                 Drainage Dips = 4 at \$105 each = \$420<br/>                 Cost = (4,000 cy x \$1.66 x 1.3 x 1.0 x 1.15) + \$420 = \$10,347</p> |
| <p><b>Step 2:</b> Base Clearing Cost = \$3,050 per Acre (from Section 201)<br/>                 Clearing Acres = 4.0 Acres/mile x 1.7 miles = 6.8 Acres<br/>                 Adjusted Clearing Cost:<br/>                 Slash Disposal Factor = 1.0<br/>                 Widening Factor = 1.2<br/>                 Cost = \$3,050 per acre x 4 Acres x 1.0 x 1.2 = \$14,640</p>  |
| <p><b>Step 3:</b> Seeding Cost = \$500 per mile (from Section 625)<br/>                 Seeding Acres = 0.6 Acres/mile x 1.7 miles = 1.02 Acres<br/>                 Cost = \$500 per Acre x 1.02 Acres = \$510</p>   |
| <p><b>Step 4:</b> Total Cost = \$10,347 + \$14,640 + \$510 = \$25,497<br/>                 Unit Cost per mile = \$25,497/1.7 miles = \$14,998 / mile</p>  |

**Table 19 - Section 212 12 ft Wide Template 2/3:1**

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

**Table 20 - Section 212 14 ft Wide Template 2/3:1**

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

**Table 21 - Section 212 12 ft Wide Template 3/4:1**

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

**Table 22 - Section 212 14 ft Wide Template 3/4:1**

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

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

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.

**Material Cost Includes:**

Haul - Calculate haul cost using prices listed in the haul section of this cost guide.

Pit or Source - Development of the pit or source if required should be calculated using time and equipment.

Royalty - Royalty charge in private pits obtained from pit owner - see FP-03, Sections 301 or 641.

Drilling and Blasting - Drilling and blasting cost of quarries, if required - see FP-03, Sections 301 or 641.

Access Roads - Access road development, if required - use time, and equipment.

Geotextile - If used - estimate material prices and pay under FP-03, Section 207.

### **Section 253 Gabions and Revet Mattresses (Labor 30-40%)**

Use time, material, and equipment to determine cost and percent labor for this item.

### **Section 255 Mechanically-Stabilized Earth Walls (Labor 40%)**

Use time, material, and equipment to determine cost and percent labor for this item. Most MSE wall systems are proprietary and must be bid according to manufacturers' specifications and recommendations. See suppliers in Appendix B Table 1 for retaining wall types.

### **Section 257 Alternate Retaining Walls**

Use time, material, and equipment to determine cost and percent labor for this item. See suppliers in Appendix B Table 1 for retaining wall types.

### **Section 262 Reinforced Soil Embankment**

Use time, material, and equipment to determine cost and percent labor for this item.

Geocell Material - Geocell materials are porous and non-porous as well as manufactured in widths and lengths other than those shown here. Call a local supplier to get the correct material and size for your application see Appendix B Table 1 or 16.

Standard Cell Sizes: 3" x 8' x 20', 4" x 8' x 20', 6" x 8' x 20', 8" x 8' x 20'

Large Cell Sizes: 3" x 8' x 40', 4" x 8' x 40', 6" x 8' x 40', 8" x 8' x 40'

Select Granular Backfill - Calculate haul using instructions in section 204.

Placement - Use time, material, and equipment to determine cost and percent labor for this item. Call supplier for support.

### **Section 303 - Road Reconditioning (Labor 40-60%)**

Normally, the majority of "reconditioning" work should be done with a grader with some minor blasting and/or tractor work for localized rock.

#### **Work included in Road Reconditioning:**

1. Removing Slides - Use time and equipment costs. (Estimate all slides in excess of 10 cubic yards per station under Section 204).
2. Pull Ditches with Grader - Assume 2 hours/mile production rate with grader, laborer, and pickup
3. Clean Catch Basins with Backhoe - Assume 15 minutes per catch-basin to clean, reshape, and dispose of material on roadbed if suitable, or on fill slope.
4. Scarifying and Shaping - average production rate equals 4 hours/mile.
5. Scarifying Heavy - equals 6 hours/mile.
6. Rate for double lane road equals single lane x 1.35

7. Finish Grading with Blade - Assume all oversize has been removed, hence no laborer required. Production rate equals 3 hours/mile. Rate for double lane road equals single lane x 1.35.
8. Compaction - Costs in \$/mile. Using roller until visible displacement ceases, minimum 3 complete passes. Double lane cost equals single lane cost x 1.35
9. Water - Estimate under Section 170 (see Complete WO FSSS 170), can be included in Section 303 if specified as indirect.
10. Constructing New Ditch - Include under Section 204
11. Erosion Control Measures - Include under Section 157
12. Clearing and Grubbing - Include under Section 201
13. Reconditioning Asphalt or Aggregate Surfaces - Costs for reconditioning of asphalt and aggregate surfaces should be estimated using Sections 204, 301, 404, 414, and 430.
14. Contractor Quality Control - Where applicable, make a subsidiary allowance to this pay item for contractor quality control.

### Section 306 Dust Palliative (Contract Item)

Refer to current dust palliative manufacturer and geotechnical engineering information for detailed information on product characteristics, application rates, estimating procedure, conversion factors and calculations.

#### The following is a summary of essential information:

1. Application Rates - See application rate below. Rates for lignin sulfonate and chloride products are based on the solid contents shown under C, "Approximate Weight-Volume Factors at 60°F," this Section. These products may be furnished with varying amounts of water and if so, adjustments based upon the weight of solids may be necessary on the application rates and payment. Rates will vary depending on the type and condition of the surface and the amount of residual dust abatement material present.
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.
3. Shipping Costs - Shipping costs are variable and should be verified for each project by contacting suppliers.
4. Road Preparation - Road preparation costs will depend on the existing surface condition, requirements in other sections such as 322 or 303, and the method specified. See Section 303 for grading costs and Section 170 for watering.
5. Application Cost - Contact supplier for information regarding the cost of application. Supplier will need to know the project location, length of project, width of application, and application rate.

**Table 23 - Approximate Weight-Volume Factors at 60°F**

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

**Table 24 - Typical Dust Palliative Application Rates**

| Type                       | Initial Application               | Subsequent Application       |
|----------------------------|-----------------------------------|------------------------------|
| Lignin Sulfonate           | 0.50 gallons/yd <sup>2</sup>      | 0.25 gallons/yd <sup>2</sup> |
| Magnesium Chloride Brine   | 0.35-0.50 gallons/yd <sup>2</sup> | 0.20 gallons/yd <sup>2</sup> |
| Calcium Chloride Brine     | 0.28-0.40 gallons/yd <sup>2</sup> | 0.16 gallons/yd <sup>2</sup> |
| Calcium Chloride Flake@77% | 1.30-1.90 lbs/yd <sup>2</sup>     | 0.75 lbs/yd <sup>2</sup>     |

## **Section 322 - Minor Aggregate Courses**

### **General**

If local conditions indicate that aggregate production will be from a commercial source, check with your Contracting Officer for applicability of Davis Bacon wage rates. Depending on the quantity size on the respective surfacing project a unit cost adjustment may need to be applied. Aggregate costs are estimated in the following categories: basic rock cost, load, haul, spread, and compact.

### **Basic Rock Cost (Labor: 45%)**

The following costs assume a production rate of 150 tons per hour. Material weighs 2,800 lbs/cy to 3,000 lbs/cy loose. Typically aggregate costs are dependent on location of pits and haul costs. The estimator should call local suppliers to verify delivered cost.

## **Section 400 - Asphalt Pavement General**

Contractor Quality Control and Testing - All allowances shall be subsidiary to other pay items. Generally contractor quality control is applicable for Items 403 through 406, 409, 410, and 412. Contractor sampling is applicable for Items 407, 408, and 413. Refer to Asphalt Products Suppliers Appendix B, Table 6.

## **Section 403 - Asphalt Concrete Pavement**

If large quantities are anticipated, compare the cost of on-site production with feasible commercial sources in the area. The in-place compacted density and asphalt content used for calculating quantities should be based on a preliminary mix design. In lieu of other information, use 150 pounds per cubic foot for in-place compacted density and 5.5% asphalt cement based on weight of total mix. Contact local State DOT for available mix designs in your area. Add 3% to the cost per ton of hot mix asphalt if anti-stripping (hydrated lime) additive is required.

## **Section 409 - Asphalt Surface Treatment**

### **Aggregate**

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

1. Crush and Stockpile – Sections 320 and 322 - Crushing costs can vary widely depending on the gradation selected, whether aggregates are produced as a by-product of other crushing operations or produced separately, and availability of commercial sources. Chips average weight is 2300 lbs/cy (loose).
2. Loading Aggregate - Use costs from Section 322.
3. Weighing - Use costs from Section 322. For small projects consider using lump sum or cubic yard measurement.
4. Hauling - Develop haul cost from Section 204
5. Road Surface Preparation, Brooming and Other Prep Work - Estimate the number of passes for power broom. Travel speed of 5-7 miles per hour.

6. Aggregate Application - Include cost of self-propelled aggregate spreader and truck time while waiting and spreading.
7. Rolling - Estimate using pneumatic-tired, self-propelled roller.
8. Traffic control - See traffic control Section 156
9. Surface Maintenance - Determine maintenance and brooming during and at the end of the curing period.
10. Temporary Centerline Marking - Call local suppliers

**Bituminous Material**

Obtain current quotes from local suppliers Appendix B Table 6. Asphalt costs are dependent upon quantity and location. Application rates for emulsified and liquid asphalts may be determined by two methods, depending on the type of table used for estimating:

1. Total Quantities - Application rates for total quantities are given under Section 409 in the Application Rate Table 25 below, and no adjustment is necessary, if asphalt emulsions are specified.
2. Residual Quantities - Application rates for residual quantities are given in Tables 409-1, 409-2 and 409-3 of the FP-03, Section 403, and actual application rates for cutback and emulsified asphalts are determined by dividing the asphalt residual rates by the percent asphalt from the applicable AASHTO materials specification for the selected type and grade.

**Table 25 - Bituminous Coat Application Rates**

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

**Bituminous Surface Treatments and Seal Coats Using Emulsified Asphalts**

When estimating use the highest rates for aggregate and asphalt emulsion shown for the type of treatment desired. Final rates should be determined by testing the aggregate after contract award. Use rock size (gradation) that is similar to local State requirements to obtain more competitive bids. Any campgrounds and administrative sites that have a buildup of soil and pine needles along the shoulder increase the costs for cleanup.

**Table 26 - Emulsified Asphalt Application Rates**

| Number and Type of Treatment | Course | Aggregate Grading | Aggregate (lb/yd <sup>2</sup> ) | Asphalt Emulsion (gallon/yd <sup>2</sup> ) |
|------------------------------|--------|-------------------|---------------------------------|--|
| No. 1 Single                 | 1      | NA                | None                            | 0.10 - 0.15                                |
| No. 2 Single                 | 1      | D                 | 18 - 23                         | 0.25 - 0.30                                |
| No. 3 Single                 | 1      | C                 | 23 - 28                         | 0.35 - 0.40                                |
| No. 4 Single                 | 1      | B                 | 28 - 33                         | 0.40 - 0.50                                |
| No. 5 Double                 | 1      | A                 | 40 - 50                         | 0.55 - 0.65                                |
| No. 5 Double                 | 2      | D                 | 15 - 20                         | 0.25 - 0.30                                |

**Section 410 - Slurry Seal**

Obtain costs from local suppliers (Appendix B Table 6).

### **Section 411 - Prime Coat**

Obtain current quotes from local suppliers (Appendix B, Table 6). Asphalt costs dependent upon quantity and location and for application rates see Table 25.

### **Section 412 - Tack Coat**

Costs dependent upon quantity and location for local suppliers. Include surface preparation and brooming cost. Remember that most tack oils are commonly sold 50% dilute in emulsion form, ready for application. When gathering price information ask whether the price quoted for the oil is "neat" (non-diluted) or diluted in emulsion form. For application rates see 25.

### **Section 414 - Asphalt Pavement Crack & Joint Sealing**

Obtain costs from supplier Appendix B Table 6. If applicable, make allowance for routing/blowing out the cracks prior to the application of crack sealer.

### **Section 415 - Paving Geotextiles**

Obtain costs from supplier Appendix B Table 16.

### **Section 430 - Asphalt Pavement Patching**

Obtain costs from supplier Appendix B Table 6.

### **Bridges**

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

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

### **Section 601 - Minor Concrete Structures (Labor 40%)**

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

Method A or B:

Concrete for minor structures (about 30 cy or less). Verify costs with local suppliers. Where applicable, make a subsidiary allowance to this item for contractor quality control.

Method C:

Very small quantities of concrete for fence posts, gate post, etc. (no forms required). Verify costs with local suppliers for Redimix short loads less than 3 CY.

### **Section 602 - Culverts and Drains (Labor 20-30%)**

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

Generally equipment and personal used for culvert installation includes: Excavator, 2 laborers, and a pick up.

**Table 27 - Culvert installation production rates**

| Work Type<br>Construction/Reconstruction | Culvert<br>Size | Length | Estimated<br>Time (hr.) |
|--|-----------------|--------|-------------------------|
| C  | 18"             | 40'    | 2                       |
| R  | 18"             | 40'    | 3                       |
| C  | 24"             | 40'    | 2                       |
| R  | 24"             | 40'    | 3                       |
| C  | 30"             | 40'    | 3                       |
| R  | 30"             | 40'    | 4                       |
| C  | 36"             | 40'    | 4                       |
| R  | 36"             | 40'    | 5                       |

Compaction Methods A, B, and C are from WO FSSS 209.11.

**Items for Culverts and Drains**

Compaction Method Factors:

Method A. No adjustment.

Method B. Add in additional 10%. Compact until visual displacement ceases

Method C. Add in additional 20%. Requires proctor and compaction testing T310

Quality Control - Unit cost for culverts installed in existing roads and pipes installed "after grade" will normally be higher than for pipes in new construction due to the increased amount of excavation (see section 204).

1. Increase the above costs by a factor of 1.1 to 1.3 to reflect longer lengths or steepness of side slopes. Estimate larger pipes by time and equipment methods. Following are some items that should be considered under Sections 602 and 209 when estimating installation of larger pipes:
2. Live stream, allow for stream diversion costs under Section 157. Consider diversion pipe, plastic sheeting, sandbags, Sedimats, turbidity curtains, pumps, and potential fish removal. Allow for installation and removal of diversions. 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, special coatings, and adjustment for pipe arches if required. Consult local suppliers for prices (Appendix B, Table 10).
3. Estimate time and equipment required (excavation equipment, compaction equipment, labor, operators, etc.) to excavate and construct the culvert bed including excavation below the invert elevation for removal of unsuitable or unstable material and to bed and backfill the pipe. If springs, seeps, or underground flows are expected in the culvert area, allowance should be made for filter cloth, drain rock, cutoffs, special bedding, or special backfill material.
4. Always check current prices with your local supplier when putting together a cost estimate, especially if there is a large quantity of culvert involved. Metal culvert prices listed are for galvanized steel only, as aluminum and aluminized steel culvert is significantly more expensive.

5. Culvert Material Base Prices – Avoid using HDPE pipe in a forest setting where fire danger may exist. Typically it is used for stream diversions due to its lighter weight per foot, or in campgrounds where metal pipe is not desired. The plastic pipe supplier list is located in Appendix B, Table 9 while the metal pipe supplier list is in Appendix B, Table 10.
6. Culvert Pipe End Treatment - Call for quotes as cost depends upon the angle of the cut and the gage of material.
7. Special Coatings - Call local suppliers for quotes (Appendix B, Table 8).
8. Flared End Sections - These end sections are available with a trash rack as well if desired to catch debris. End sections can also be acquired for pipe arches, call for material pricing (Appendix B, Tables 9-10).

### **Section 603 - Structural Plate Structures (Labor 20%)**

Costs do not include the cost of the footing, structural excavation, embankment, or riprap. Each project should be estimated on material, time, and equipment basis. When applicable, make a subsidiary allowance to this pay item for contractor quality control. Call local suppliers for cost (Appendix B, Table 10).

### **Section 604 - Manholes, Inlets, And Catch Basins (Labor 25%)**

Consult local suppliers for cost (Appendix B, Table 11). Use time and equipment for installation.

### **Section 605 – Underdrains, Sheet Drains, and Pavement Edge Drains**

Supplier list is located in Appendix B, Table 12.

### **Perforated pipe cost per lineal foot (Labor 40%)**

Add 12 percent to standard culvert price.

### **Special Sections**

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

### **Porous Backfill or Filter Material (Labor 10%)**

Develop price from rock costs plus the haul cost as determined from Section 204 of the cost guide. Haul cost to be estimated from the nearest point of manufacture.

### **Geotextiles (Labor 10%)**

When using geotextiles, the pipe must be placed in freely draining porous material.

### **Granular underdrain (Labor 25%)**

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

### **Sheet Drains (Labor 30%)**

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%)**

Use time, material, and equipment.

1. Round Pipe - If round pipe is used, the unit cost should be about 70% of the installed unit cost for the same diameter listed in Section 602 for new construction, unless difficult slope conditions are encountered.
2. Elbows - Include two connecting bands.
3. Anchors - Estimate by material and time.
4. Berm Drain - Unit cost consists of installation of prefabricated 12" diameter corrugated metal catch basin, with slip joint and 20 feet of 8" corrugated metal downspout with downspout anchors.
5. Flexible Downdrain - Lowest price for larger quantity of 200 or more lineal feet.
6. Inlets - Inlet assemblies are estimated the same as Section 602, End Sections.
7. Downpipe - Downpipe is measured by the quantity of lineal feet installed including accessories except inlets. Inlet assemblies are measured by the number installed and accepted. Estimates should include gaskets.
8. Anchors - Anchors are required for downpipes. Anchors should be placed approximately every 10 feet and at the outlet. A culvert anchor installation may consist of stakes and bands or two metal fence posts and wire. The metal fence post culvert anchor may be used for downpipe up to 30" in diameter. 30" diameter pipe and larger will require anchors especially designed for them.

### **Section 607 Cleaning, Reconditioning, and Repairing Existing Drainage Structures (Labor 60%)**

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

### **Section 609 Curb And Gutter (Labor 40-50%)**

Use time, materials, and equipment estimate. Consult local contractors for pricing.

### **Section 615 Sidewalks, Drive Pads, and Paved Medians (Labor 40-50%)**

Use time, materials, and equipment estimate. Consult local contractors for pricing.

### **Section 617 Guardrail**

Call local suppliers for price quotes on material prices (Appendix B, Table 12). Contact local State DOT for more information. When guardrail is required on both sides of the roadway, include the total length of rail on both sides. The length of the rail is determined by measuring the face of the guardrail.

### **Section 618 Concrete Barriers and Precast Guardwalls**

Call manufacturer for price quotes on material prices (Table Appendix B, Table 14).

### **Section 619 Fences, Gates and Cattleguards**

Use this specification only for facilities being built for campgrounds and rights-of-way. Use FSSS 650 for Road closure Devices. Consult local suppliers (Appendix B, Table 15).

1. Fences (Labor 60%) - Four strand barbed wire estimate by time, equipment and material and consult local suppliers (Appendix B, Table 15).
2. Gates (Labor 15% metal gates, 65% wire gates) - estimate by time, equipment and material and consult local suppliers (Appendix B, Table 15).
3. Cattleguard (Labor 10%) - estimate by time, equipment and material and consult local suppliers (Appendix B, Table 15). The wings and base are subsidiary to the cost of the cattle guard.

**Table 28 - Cattleguard Cost Adjustment Factors**

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

Precast concrete base weighs approximately 5,000 pounds/side, ensure adequate lifting capacity is specified for the placement of cattle-guard base.

**Section 621 - Monuments and Markers (Labor 25%)**

Estimate by time, equipment, and material. See Section 634 for more information.

**Section Rental Equipment**

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

The rates shown herein were derived from the *Rental Rate Blue Book for Construction Equipment*. The models shown should be considered typical and their rates can be applied to similar equipment. Local rates should be used if local equipment is generally available at a rate different than those shown herein. Appendix B includes the hourly equipment costs from the 2012 Blue Book without an operator but with 10% profit included.

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

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

The use of brand names is for the ease of identification of the type and size of equipment and does not constitute an endorsement of any product.

### **Section 624 - Top Soiling (Labor 50%)**

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

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

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

### **Section 625 - Turf Establishment**

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

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

Cost of fertilizer, where required, should be included in the base item. Fertilizer, Section 625.06, should be used only for supplemental applications. If Native Grass Seed is required, get a quote from a supplier.

See Section 157 for more seeding options.

### **Section 629 - Rolled Erosion Control Products and Cellular Confinement Systems**

Consult local suppliers (Appendix B, Table 16).

### **Section 633 - Permanent Traffic Control (Labor 60%)**

Consult local suppliers (Appendix B, Table 17). Costs must be increased if sign posts are to be installed in rocky fills or other situations requiring difficult excavation.

### **Section 634 Permanent Pavement Markings (Contract Item)**

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

See FSSS Section 634 for application rates for paint and beads. Consult local suppliers (Appendix B, Table 18) and local State DOT for contractors.

### **Section 650 - Road Closure Devices**

Estimate by time, equipment and material. Contact local supplier list (Appendix B, Table 19).

Labor:           Metal Gates - 15%  
                  Concrete Barriers - 10%  
                  Guardrail Barriers - 30%

### **Section 651 - Development of Pits and Quarries**

Clearing, grubbing, and slash clean-up should be estimated as recommended for Section 201, include 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. 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.

Turf establishment may be estimated per instructions in Section 625.

Ground and traffic control estimated per requirements in Section 635.

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

## Timber Sale Wage Rate Adjustments

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

The following labor percentage ranges shown in Table 29 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 29 - Labor Percentage Ranges**

| Work Item                                | Percent Labor | Low Percent Factors  | High Percent Factors  |
|--|---------------|--|---|
| 151-Mobilization                         | 30-60         | Short travel distance with few pieces of equipment to dismantle and reassemble.                    | Long travel distance, many pieces of equipment to move, dismantling and assembly of equipment, semi-permanent structures, platforms, etc., to erect for project support |
| 201-Clearing and Grubbing                | 40-55         | Small timber, light ground cover, gentle terrain, good soils, scattering, accessible to equipment. | Large timber, heavy ground area, difficult terrain, poor soils and rock, pile and burn, inaccessible to equipment.  |
| 204-Excavation and Embankment            | 20-45         | Gentle terrain, good soils, wide poor soils and tolerances, no blasting                            | Difficult terrain, rock, close tolerance, blasting, and haul.   |
| This item may be broken down as follows: |               |  |   |
| Earthmoving                              | 24            |  |   |
| Slope, Rounding, and Benching            | 25            |  |   |
| Compaction                               | 30            |  |   |
| Scarification                            | 45            |  |   |
| Drill and Blast                          | 86            |  |   |
| Traffic Control                          | 90            |  |   |
| Station-Yard Overhaul                    | 23            |  |   |
| Yd <sup>3</sup> -mile Overhaul           | 37            |  |   |
| 209-Structure Excavation and Backfill    | 35-45         | Gentle terrain, good soils, easy equipment access, no dewatering.                                  | Difficult terrain, poor soils and rock, equipment access difficult, dewatering required.  |
| 251-Riprap                               |               |  |   |
| Hand-Placed                              | 75            |  |   |
| Machine-Placed                           | 35            |  |   |
| Sacked                                   | 60            |  |   |
| Wire-Enclosed                            | 75            |  |   |

| Work Item                                  | Percent Labor | Low Percent Factors  | High Percent Factors  |
|--|---------------|--|---|
| 253-Gabions                                | 30-40         |  |   |
| 303-Road Reconditioning                    | 40-60         |  |   |
| 322-Minor Aggregate Course                 | 30-50         | Crushed pit rock, wide gradation tolerance   | Crushed quarry rock, close gradation tolerance.                     |
| 400-Asphalt Pavement                       | 20-30         | Large project, road mix, wide tolerance  | Small project, plant mix, close tolerance, labor intensive.         |
| 550-Bridge Construction                    | 20-30         | No reduction if purchaser is not equipped to perform. Requires analysis of equipment, labor, and materials |   |
| 602-Culverts and Drains                    | 20-30         | Gentle terrain, easily available bedding and backfill material.  | Steep pipe grade, poor gradation for bedding and backfill material. |
| 605-Underdrains (Installation Only)        | 90            |  |   |
| Backfill                                   | 10            |  |   |
| Filter Cloth                               | 10            |  |   |
| Special Granular Backfill                  | 25            |  |   |
| 606-Corrugated Spillways Installation Only | 20<br>80      |  |   |
| 619-Fences, Gates and Cattleguards         | 10            |  |   |
| Metal gates and cattleguards               | 15            |  |   |
| Fence and wire gates                       | 60-65         |  |   |
| 625-Turf Establishment                     | 30-50         | Hydromulch, flat slopes, large project.  | Hand-placed mulch, steep slopes, small project.                     |

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

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

30 below is just for reference and lists the reduction percentages to be applied to the labor costs for each work item based on the state where the project is located.

30 on the following page provides the unit costs adjustment factors to apply to the Davis-Bacon wages unit costs based on the percent labor involved and the work zone.

**Table 30 - State Labor Reduction Percentages**

| State      | Reduction     | State      | Reduction     | State        | Reduction     |
|------------|---------------|------------|---------------|--------------|---------------|
| Arizona    | No Adjustment | Kansas     | No Adjustment | South Dakota | No Adjustment |
| California | No Adjustment | Nebraska   | No Adjustment | Utah         | No Adjustment |
| Colorado   | No Adjustment | Nevada     | No Adjustment | Wyoming      | No Adjustment |
| Idaho      | No Adjustment | New Mexico | No Adjustment |              |               |

**Procedures to Determine Costs**

To determine the Estimated Timber Sale Road Construction Cost for any item, use the following procedure:

1. Start with Public Works Unit Cost
2. Determine labor percentage for applicable items in the FP-03 Sections of this Guide or from Table 29.
3. Multiply the Public Works Unit Cost by the labor percentage found in step one to determine the Davis Bacon Labor cost.
4. Multiply the Davis Bacon Labor cost by the state labor reduction percentage in Table 30 to determine the Timber Sale Labor Cost.
5. Add the Timber Sale Labor Cost back into the unit material cost [Public Works Unit Cost x (1-percent of labor)] to determine Timber Sale Unit Cost.

|   |
|---|
| <p>Example - Timber Sale Road Construction Cost</p> <ol style="list-style-type: none"> <li>1. Public works unit excavation cost = \$1.90/cy</li> <li>2. Excavation: labor percentage (from Table 3) = 25%</li> <li>3. \$1.90/cy x 25% = \$0.475/cy (public works labor cost)</li> <li>4. Project location: Idaho<br/>Unit cost adjustment factor (from Table 4) = 0.93<br/>\$0.475/cy x 0.93 = \$0.442/cy (timber sale labor cost)</li> <li>5. <math>[\\$1.90/cy \times [1-(25\%)]] + \\$0.442/cy = \\$1.867/cy \sim \\$1.88/cy</math> (timber sale unit cost)</li> </ol> |
|---|

Note: to determine completion date for timber sale road construction projects see Appendix A

**Cost Estimating for Temporary Roads**

The decision to construct temporary roads for a timber sale or other activity is based on transportation planning and resource objectives that are documented in a NEPA decision. Temporary roads generally are built for one or two seasons of use for limited traffic. The National Forest Management Act (NFMA) requires that any temporary road built as part of a timber sale or other permit/lease shall be designed with the goal of reestablishing vegetative cover on the roadway and adjacent disturbed area within ten years after the termination of the

contract, permit, or lease. In addition to this NFMA requirement, the timber sale contract requires outslowing, removal of culverts and ditches, and building water bars or cross ditches after the road is no longer needed.

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

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

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

**Step 1a:** Using Table 31, determine the quantity in acres for clearing and grubbing based on the average sideslope of the temporary road. Calculate the cost per mile by multiplying the quantity by the clearing unit cost per acre from section 201. Apply the appropriate topographic factors from Section 201. Make adjustment for the method of slash disposal used.

Adjust the cost per mile for Davis-Bacon work Areas using in the Engineer's Estimate section. Adjust for Purchaser wage rate, if applicable, from Table 30 "State Labor Reduction Percentages".

**Step 1b:** The timber sale appraisal makes cost allowances for felling, bucking, and skidding for temporary roads so these costs must be removed from the clearing cost calculated here. Contact the Timber staff responsible for the timber sale to obtain the appropriate costs to remove. Also, the timber staff should have the volume per acre data as well. If additional clearing width is desired for windrow placement, etc., make necessary cost allowances.

**Step 2:** Using Table 31, determine excavation quantity per mile based on the average side slope for the temporary road. Calculate the cost per mile by multiplying the quantity by the base cost per cy for excavation from Section 204. Make adjustments for type of excavation material, if any. If turnouts or turn-arounds are desired, adjust excavation costs accordingly (See Section 212).

**Step 3:** Using Table 31, determine seeding quantity per mile based on the average side slope for the temporary road. Calculate the cost per mile by multiplying the quantity by the unit cost per acre of the turf establishment method used (See Sections 157 and 625). The quantities listed for seeding includes the roadbed and all slopes.

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

- Step 5:** Total the unit per mile costs determined in Steps 1 through 4.
- Step 6:** Multiply unit cost from Step 5 by the length of the temporary road(s).
- Step 7:** Determine the total cost of drainage structures from the appropriate sections of this guide:
- Step 8:** Add the costs determined in Steps 6 and 7. Add an allowance of 7% for Mobilization.
- Step 9:** Remove Profit allowance by dividing the total in Step 8 by 1.10.

Example - Temporary Road Construction

Location: Idaho Area 2  
 Average side slope: 30%  
 Estimated length: 1.5 miles  
 Timber volume: 20 MBF/acre  
 Slash: Disposal on site  
 Drainage structures: 3 drain dips  
                           1 - 18" x 40' culvert  
                           1 - 24" x 36' culvert  
 Obliteration: Outslope and rip roadbed

**Step 1:** Clearing and grubbing = 2.11 acres/mile (from Table T-1)  
 Unit cost for 20 MBF/acre = \$2,600/acre (Section 201)  
 Percent labor = 40% (Table 3)  
 Adjustment factor for Davis-Bacon wages for Idaho Area 2 = 1.02  
 Adjustment factor for Timber Sale wage rate = 0.88 (Table 5)  
 Topographic factor for 30% side slope = 1.0 (Table T-1)  
 Slash/Clean Up factor for disposal on site = 1.2 (Table 16)  
 Cost = 2.11 acres/mile \* \$2,600/acre \* 1.02 \* 0.88 \* 1.0 \* 1.2 = \$5,909/mile

**Step 1a:** Cost allowance for felling, bucking, and skidding = \$78.03/MBF (from the Timber staff)  
 Cost = 20 MBF/acre \* \$78.03/MBF \* 2.11 acres/mile = \$3,293/mile  
 Final Step 1 Cost = \$5,909/mile - \$3,293/mile = \$2,616/mile

**Step 2:** Excavation = 1,726 cy/mile (Table 15)  
 Base cost for excavation from Section 204 = \$1.66/cy (Section 204)  
 Adjustment factor for common excavation materials = 1.0 (Table 18)  
 Percent labor = 30% (reference labor percent given in Section 204)  
 Adjustment factor for Davis-Bacon wages for Idaho Area 2 = 1.02 (Table 4)  
 Adjustment factor for Timber Sale wage rate = 0.92 (Table 5)  
 Cost = 1,726 cy/Mile \* \$1.66/cy \* 1.0 \* 1.02 \* 0.92 = \$2,689/mile

**Step 3:** Seeding = 2.38 acres/mile (from Table 15)  
 Unit cost for seeding with fertilizer, no mulch = \$500/acre (from Section 625)  
 Percent labor = 50% (reference labor percent given in Section 625)  
 Adjustment factor for Davis-Bacon wages for Idaho Area 2 = 1.02 (Table 4)  
 Adjustment factor for Timber Sale wage rate = 0.87 (Table 5)  
 Cost = 2.38 acres/mile \* \$500/acre \* 1.03 \* 0.87 = \$1,066/mile

**Step 4:** Outslope road = \$1,125/mile (from Section 211)  
 Rip roadbed= \$750/mile (from Section 211)  
 Percent labor = 40% (reference labor percent given in Section 211)  
 Adjustment factor for Davis-Bacon wages for Idaho Area 2 = 1.02 (Table 4)  
 Adjustment factor for Timber Sale wage rate = 0.88 (Table 5)  
 Cost = (\$1,125/mile + \$750/mile) \* 1.02 \* 0.88 = \$1,683/mile

**Step 5:** (Step 1) - (Step 1a) + (Step 2) + (Step 3) + (Step 4) =  
 \$2,616/mile + \$2,689/mile + \$1,066/mile + \$1,683/mile = \$8,054/mile

**Step 6:** \$8,054/mile x 1.5 miles = \$12,081

**Step 7:** 3 Drain Dips at \$125 each = \$375 (from Section 204)  
 1 - 18" x 40' CMP at \$30.50/LF = 40 x \$30.50 = \$1,220 (from Section 602)  
 1 - 24" x 36' CMP at \$35.70/LF = 36 x \$35.70 = \$1,285 (from Section 602)  
 Total drainage structure cost = \$330 + \$1,120 + \$1,188 = \$2,638 Percent labor = 30%.  
 Davis Bacon Wage \* State Overhead Factor = 1.02 (from Table 4)  
 Adjustment factor for Timber Sale wage rate = 0.92 (from Table 5)  
 Cost = (\$375 + \$1,220 + \$1,285) \* 1.02 \* 0.92 = \$2,703

**Step 8:** (Step 6) + (Step 7) = \$12,081 + \$2,703 = \$14,784  
 Mobilization = \$14,784 x 0.07 = \$1,035  
 Total Cost = \$14,784 + \$1,035 = \$15,819

**Step 9:** \$15,819/1.10 (profit) = \$14,380 (rounded)

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

**Table 31 Summary of Quantities**

| Average Side slope (%)   | Excavation per mile (cy) | Clearing per mile (acre) | Seeding per mile (acre) |
|--|--------------------------|--------------------------|-------------------------|
| 10   | 386                      | 1.63                     | 1.69                    |
| 20   | 1023                     | 1.83                     | 1.99                    |
| 30   | 1726                     | 2.11                     | 2.38                    |
| 40   | 2753                     | 2.51                     | 2.92                    |
| 50   | 4239                     | 3.11                     | 3.74                    |
| Summary of quantities for a 12 foot wide road template w/o ditch, with 3/4:1 cut slopes and 1.33:1 fill slopes<br>No Minimum clearing width, seeding applied to ALL slopes and roadbed.<br>Clearing limits are 0 feet beyond top of cut, 0 feet beyond toe of fill.<br>Excavation is based on self-balanced sections, compaction factor of 25% was used. |                          |                          |                         |

**Completion Date Determination for Timber Sale Road Construction Projects**

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

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

When the construction of specified roads in a timber sale contract can be turned back to the Forest Service, consider the effect on the road completion date. Allow sufficient time for the Forest Service to prepare a public works contract, receive a satisfactory bid, and have the road construction work completed by the "Road Completion Date" stated in the Timber Sale Contract. A minimum of 155 days should be allowed to prepare, solicit, and award a Public Works contract.

Whenever the Total Estimated Road Construction Cost for a timber sale is \$50,000 or more, consider the possibility of a turn-back. (*reference FSH 2409.18 43.5*) Use the following form to track the various time components associated with a turn-back and to determine if the proposed road completion date to be included in the timber sale contract is attainable.

Check with local Timber Sale CO. for current revisions.

Form 1 - Time Estimating and Scheduling Form

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

- |    |  |                               |
|----|--|-------------------------------|
| 1. | Timber Sale (T.S.) Advertisement Date  | _____                         |
| 2. | Sale Advertising Period<br>Timber Sale Bid Opening Date  | 30 Days<br>_____              |
| 3. | Period specified in the T.S. advertisement to allow the F.S. to solicit and award a P.W. Contract for the road construction. (155 days minimum is recommended. See note below)<br><br>Public Works Construction Award Date | * 155 - 170 Days<br><br>_____ |
| 4. | Additional time needed between P.W. contract award date and date construction could start.<br><br>Public Works Construction Start Date   | 10 Days<br><br>_____          |
| 5. | Total calendar days elapsed time allowed for completion of road construction Public Works contract.<br><br>Computed Construction Completion Date   | _____<br>Days<br><br>_____    |
| 6. | Additional time for expected excusable delays for P.W. contracts. This time will only be added to determine the road completion date in a Timber Sale (C5.13#) not to determine contract time for a Public Works contract. | _____<br>Days                 |

- |    |   |         |
|----|---|---------|
| 7. | W.O. approval for projects over \$100,000. (see note below) | 15 Days |
| 8. | Final Road Completion Date                                  | _____   |
| 9. | Planned Timber Sale Termination Date                        | _____   |

\* The time permissible may vary by local policy. Check with the Timber staff to see if there are any Regional supplements that may dictate the maximum time period. The time period is comprised of the following items:

1. 80 days for Engineering to convert the timber sale road contract to Public Works format, including modification of supplemental specifications, development of contract documents, and to submit road package to Administrative Services. Additionally, Job Codes must be set up, Work Plan developed, and IAS data entry and approval process must be completed
2. 5 days for AQM to prepare solicitation documents
3. 15 days synopsis (Fedbizopps.gov) by AQM
4. 15 days notice to public prior to solicitation.
5. 30 days advertising period.
6. 15 days to evaluate bids and make award
7. If project is over \$100,000 and will not be set aside as an 8a, HubZone or SDVOSB (Service Disabled Veteran Owned Small Business) contract add 15 days for W.O. approval
8. Consider additional time if access to project for pre-bid tour is not available due to inclement weather or other restrictions

**Appendix A  
Equipment Rates**



**Table 1 - AIR COMPRESSORS, PORTABLE, RECIPROCATING:**

| Cubic Feet per minute | Hourly Rates (\$) |            |                |
|-----------------------|-------------------|------------|----------------|
|                       | AZ, ID, NM, UT    | CO, KS, NE | CA, NV, SD, WY |
| 100                   | 10.83             | 10.97      | 11.24          |
| 185                   | 20.24             | 20.42      | 20.74          |
| 300                   | 34.83             | 35.19      | 35.87          |
| 600                   | 67.73             | 68.30      | 69.37          |
| 900                   | 77.20             | 77.97      | 79.41          |
| 1300                  | 115.72            | 116.78     | 118.74         |

Note: Includes hose and fittings, diesel powered.

**Table 2 - ASPHALT PAVER: Diesel powered**

| Model   | Hourly Rate (\$) |                |                |
|---|------------------|----------------|----------------|
|   | AZ, NM, UT       | CO, KS, NE, NV | CA, ID, SD, WY |
| Blaw-Knox diesel 8' Wheel Mounted PF-161 Wedge-Lock 2WD   | 155.06           | 163.96         | 172.72         |
| Blaw-Knox diesel 10' Wheel Mounted PF-3172 Wedge-Lock 2WD | 185.01           | 195.33         | 205.48         |
| Barber-Greene diesel 8' Crawler BG-225C Pavemaster 8B     | 200.10           | 211.15         | 222.04         |
| Barber-Greene diesel Crawler BG-245C 8-16 Extend-A-Mat    | 207.23           | 218.86         | 230.31         |

**Table 3 - CLAMSHELL: Crawler mounted, diesel powered:**

| Model               | HP  | Bucket Size<br>CY | Hourly Rate (\$)  |                   |               |                            |                   |               |
|---------------------|-----|-------------------|-------------------|-------------------|---------------|----------------------------|-------------------|---------------|
|                     |     |                   | without bucket    |                   |               | with HD Square nose bucket |                   |               |
|                     |     |                   | AZ, ID,<br>NM, UT | CO, KS,<br>NE, NV | CA, SD,<br>WY | AZ, ID,<br>NM, UT          | CO, KS,<br>NE, NV | CA, SD,<br>WY |
| American 5220 125hp | 125 | 2                 | 134.55            | 138.22            | 144.28        | 143.32                     | 147.31            | 153.91        |
| Northwest 70-D/7060 | 232 | 3                 | 187.62            | 192.58            | 200.77        | 198.63                     | 204.00            | 212.85        |

**Table 4 - Cranes: Rough Terrain, Hydraulic, self-propelled, diesel powered:**

| Model                              | Capacity | Max Reach | Hourly Rate (\$) |                    |        |
|------------------------------------|----------|-----------|------------------|--------------------|--------|
|                                    | TON      | Feet      | AZ, ID, NM, UT   | CA, CO, KS, NE, NV | SD, WY |
| Broderson RT300-2C 4x4x4 13.6T 60' | 15       | 60        | 77.07            | 78.70              | 81.06  |
| Terex CD225 4x4x4 22.7T 72'        | 25       | 75        | 66.13            | 67.54              | 69.59  |
| Terex RT230 4x4x4 27.2T 94'        | 30       | 95        | 70.34            | 70.34              | 74.15  |
| Grove RT700E 4x4x4 50T 110'        | 55       | 110       | 138.26           | 141.10             | 145.23 |

**Table 5 - Compactors: Static, self-propelled, diesel powered, tandem:**

| Model                   | Capacity | Hourly Rate (\$) |                |            |
|-------------------------|----------|------------------|----------------|------------|
|                         | Tons     | AZ, ID, NM, UT   | CO, KS, NE, NV | CA, SD, WY |
| Bomag BW5AS 6 TON       | 6        | 32.79            | 33.79          | 35.35      |
| Ferguson 5-8B 9 TON     | 9        | 32.68            | 33.44          | 34.63      |
| Ferguson 8-12B 12.5 TON | 12.5     | 35.48            | 36.36          | 37.72      |
| Ferguson 10-14B 14 TON  | 14       | 36.09            | 36.99          | 38.39      |

**Table 6 - Vibratory, self propelled, diesel powered, tandem:**

| Model                 | Drum Width | Hourly Rate (\$) |                |            |
|-----------------------|------------|------------------|----------------|------------|
|                       | Inches     | AZ, ID, NM, UT   | CO, KS, NE, NV | CA, SD, WY |
| Bomag BW100AD-4 39.4" | 39         | 26.11            | 26.93          | 28.21      |
| Bomag BW161AD-4 66.1" | 66         | 80.35            | 83.06          | 87.27      |
| Dynapac CC622 84"     | 84         | 98.23            | 101.52         | 106.63     |

**Table 7 - Rubber tired, pull type, static:**

| Model                        | Wheels | Capacity | Hourly Rate (\$) |                |            |
|------------------------------|--------|----------|------------------|----------------|------------|
|                              |        | Tons     | AZ, ID, NM, UT   | CO, KS, NE, NV | CA, SD, WY |
| Hercules PT-9 9.6t 9 wheels  | 9      | 9.6      | 14.94            | 15.47          | 16.29      |
| Hercules PT-11 13t 11 wheels | 11     | 13       | 15.60            | 16.15          | 17.01      |
| Hercules PT-13 17t 13 wheels | 13     | 17       | 17.06            | 17.67          | 18.62      |

**Table 8 - Rubber-tired, self propelled, diesel powered, static:**

| Model                        | Wheels | Hourly Rate (\$) |                |            |
|------------------------------|--------|------------------|----------------|------------|
|                              |        | AZ, ID, NM, UT   | CO, KS, NE, NV | CA, SD, WY |
| Ferguson SP912 9 wheels      | 9      | 37.16            | 38.28          | 40.02      |
| Ferguson SP1118 11 wheels    | 11     | 40.30            | 41.59          | 43.59      |
| Caterpillar PS-150C 9 wheels | 9      | 51.80            | 53.54          | 56.26      |
| Ferguson SP1130 11 wheels    | 11     | 58.65            | 60.50          | 63.38      |

**Table 9 - Sheepsfoot, self propelled, single drum, vibratory:**

| Model  | Drum Width<br>Inches | Hourly Rate (\$) |                |            |
|--|----------------------|------------------|----------------|------------|
|  |                      | AZ, ID, NM, UT   | CO, KS, NE, NV | CA, SD, WY |
| Bomag BW177PDH-3 66.4" - listed under Single Drum Vib. | 66                   | 53.66            | 54.86          | 56.71      |
| Bomag BW213PDBH-3 84" - listed under Single Drum Vib.  | 84                   | 73.39            | 74.99          | 77.49      |

**Table 10 - Handheld, vibratory plate compactors:**

| Model                    | HP  | Hourly Rate (\$) |                |            |
|--------------------------|-----|------------------|----------------|------------|
|                          |     | AZ, ID, NM, UT   | CO, KS, NE, NV | CA, SD, WY |
| 21", Gas, Reversible 6hp | 6   | 7.92             | 8.14           | 8.48       |
| 25", Gas, Reversible 9hp | 9   | 11.58            | 11.90          | 12.40      |
| 13.5"x17" Gas Rammer     | 4.5 | 6.19             | 6.36           | 6.62       |

**Table 11 - Drills: Mobile air track: (with drill and feed)**

| Model                              | Max Hole Size<br>Inches | Hourly Rate (\$) |            |                |
|------------------------------------|-------------------------|------------------|------------|----------------|
|                                    |                         | AZ, ID, NM, UT   | CO, KS, NE | CA, NV, SD, WY |
| Ingersoll-Rand Rotary CM345/EVL130 | 4                       | 48.25            | 49.49      | 51.82          |
| ingersoll-Rand Rotary ECM350/VL140 | 4                       | 57.07            | 58.60      | 61.45          |

**Table 12 - Graders, Motor: (Basic machine plus EROPS and rear scarifiers):**

| Model                      | Engine | Moldboard size | Hourly Rate (\$) |                    |            |
|----------------------------|--------|----------------|------------------|--------------------|------------|
|                            | HP     | Feet           | AZ, NM, UT       | CO, ID, KS, NE, NV | CA, SD, WY |
| Caterpillar 120H 12' 125hp | 125    | 12             | 39.93            | 68.22              | 39.93      |
| Caterpillar 12H 12' 145hp  | 145    | 12             | 45.54            | 78.77              | 45.54      |
| Deere 770C II 12' 155hp    | 155    | 12             | 52.25            | 92.09              | 52.25      |
| Caterpillar 14H 14' 220hp  | 220    | 14             | 69.36            | 133.27             | 69.36      |
| Caterpillar 16H 16' 285hp  | 285    | 16             | 88.50            | 173.60             | 88.50      |

**Table 13 – Hydraulic Excavators: Crawler mounted tractor, with thumb, diesel powered:**

| Model                                       | Capacity    | Weight | Hourly Rate (\$) |                |            |
|---|-------------|--------|------------------|----------------|------------|
|   | Cubic Yards | Tons   | AZ, ID, NM, UT   | CO, KS, NE, NV | CA, SD, WY |
| Caterpillar 312C L 0.68cy 90 hp             | 0.68        | 14     | 73.69            | 75.76          | 79.16      |
| Caterpillar 315C L 0.77cy 110 hp            | 0.77        | 18     | 87.30            | 89.70          | 93.65      |
| Caterpillar 320C L 1.25 cy 138 hp           | 1.25        | 23     | 114.66           | 117.80         | 122.99     |
| Caterpillar 325C L 1.5 cy 186 hp            | 1.25        | 30     | 134.18           | 137.62         | 143.31     |
| Caterpillar 330C L 2.25 cy 244 hp           | 2.25        | 38     | 161.56           | 165.58         | 172.23     |
| Caterpillar 345B L Series II 2.5 cy 321 hp  | 2.50        | 49     | 234.97           | 241.08         | 251.14     |
| Caterpillar 365B L Series II 3.61 cy 404 hp | 3.60        | 75     | 298.04           | 305.62         | 318.13     |
| Caterpillar 385B L 6.0 cy 513 hp            | 6.00        | 94     | 390.60           | 400.95         | 418.03     |

**Table 14 - MINI – Hydraulic Excavators: Crawler mounted tractor, diesel powered:**

| Model                                  | Capacity    | Hourly Rate (\$) |                |            |
|--|-------------|------------------|----------------|------------|
|  | Cubic Yards | AZ, ID, NM, UT   | CO, KS, NE, NV | CA, SD, WY |
| Deere 17ZTS(ROPS) 0.05cy bucket 12.3hp | 0.05        | 11.60            | 11.88          | 12.36      |
| CAT 303.5C CR Cab 0.27cy bucket 22.9hp | 0.07        | 23.17            | 23.74          | 24.69      |

**Table 15 – Backhoe; diesel power, standard 24” bucket, extend-a-hoe, with EROPS:**

| Model  | Digging Depth | Hourly Rate (\$) |                |            |
|--|---------------|------------------|----------------|------------|
|  | Feet          | AZ, ID, NM, UT   | CO, KS, NE, NV | CA, SD, WY |
| Deere 310G 2WD 70 HP-1CY Dig 14' 5" Extendable               | 14' - 5"      | 34.65            | 35.69          | 37.03      |
| CASE 580 SuperM Series 2 4WD 90 HP-1CY Dig 17' 6" Extendable | 17' - 6"      | 42.51            | 43.77          | 45.40      |
| Deere 410G 2WD 92 HP- 1.3CY Dig 16' 1" Extendable            | 16' - 1"      | 45.57            | 46.96          | 48.77      |
| Deere 410G 2WD 92 HP- 1.3CY Dig 16' 1" Extendable            | 19' - 6"      | 53.76            | 55.54          | 57.85      |
| Cat 446D 4WD 101 HP-1.5CY Extendable                         | 21' - 2"      | 67.28            | 69.68          | 72.80      |
| Deere 710G 4WD 118 HP-1.6CY Dig 17' 10" Extendable           | 17' - 10"     | 78.65            | 81.45          | 85.08      |

**Table 16 - Loaders: Crawler type, diesel powered, with EROPS:**

| Model                    | Bucket Size | Hourly Rate (\$) |                |          |
|--------------------------|-------------|------------------|----------------|----------|
|                          | Cubic Yards | AZ,NM,UT         | CO,ID,KS,NE,NV | CA,SD,WY |
| Caterpillar 939C 1.50 CY | 1.30        | 61.41            | 63.62          | 66.49    |
| Deere 605C 1.7 CY        | 1.50        | 72.12            | 74.88          | 78.46    |
| Caterpillar 953C 2.42 CY | 2.42        | 91.79            | 95.28          | 99.82    |
| Caterpillar 963C 3.2 CY  | 3.20        | 120.57           | 125.04         | 130.83   |
| Caterpillar 973C 4.19 CY | 4.19        | 174.35           | 180.99         | 189.61   |

**Table 17 – Loader Wheel type, diesel powered, articulated, 4-wd, with EROPS:**

| Model                            | Bucket Size | Hourly Rate (\$) |                |          |
|----------------------------------|-------------|------------------|----------------|----------|
|                                  | Cubic Yards | AZ,NM,UT         | CO,ID,KS,NE,NV | CA,SD,WY |
| Caterpillar 906 1.0cy            | 1.00        | 32.16            | 33.08          | 34.28    |
| Caterpillar IT14G 1.7 cy         | 1.70        | 45.96            | 47.42          | 49.30    |
| Case 621E 2.56cy                 | 2.50        | 59.89            | 61.68          | 64.00    |
| Caterpillar 950H 4.0cy           | 4.00        | 79.05            | 81.68          | 85.09    |
| Caterpillar 966G Series II 5cy   | 5.00        | 93.62            | 96.48          | 100.19   |
| Caterpillar 980G Series II 7.0cy | 7.00        | 127.90           | 131.82         | 136.89   |
| Caterpillar 988H 8.33cy          | 8.20        | 230.44           | 238.88         | 249.81   |

**Table 18 - Skid steer type, diesel powered:**

| Model               | Hourly Rate (\$) |                |          |
|---------------------|------------------|----------------|----------|
|                     | AZ,NM,UT         | CO,ID,KS,NE,NV | CA,SD,WY |
| Bobcat S100 33.5 hp | 23.39            | 24.24          | 25.33    |
| CASE 435 - 72hp     | 34.63            | 35.71          | 37.11    |

**Table 19 - Pumping Units (Trash): Portable, self priming: (See Note Below About Hoses)**

| Pump Size<br>Inches | Engine<br>Type | Pump Capacity<br>gallons/hr | Hourly Rate (\$) |          |              |
|---------------------|----------------|-----------------------------|------------------|----------|--------------|
|                     |                |                             | AZ,ID,NM,UT      | CO,KS,NE | CA, NV,SD,WY |
| 2                   | Gas            | 10,000                      | 7.00             | 7.13     | 7.36         |
| 3                   | Gas            | 18,000                      | 10.69            | 10.86    | 11.20        |
| 4                   | Gas            | 36,000                      | 13.78            | 14.02    | 14.48        |
| 6                   | Gas            | 90,000                      | 56.93            | 57.66    | 59.07        |
| 8                   | Diesel         | 125,000                     | 46.26            | 47.31    | 49.31        |
| 10                  | Diesel         | 160,000                     | 55.07            | 56.30    | 58.65        |

Note: Unit costs for 2"-6" pumps include 25' of suction and 200' of discharge hose with couplings.

**Table 20 - Saws - Chainsaw:**

| Bar Size | Engine<br>cu.in. | Hourly Rate (\$) |          |              |
|----------|------------------|------------------|----------|--------------|
|          |                  | AZ,ID,NM,UT      | CO,KS,NE | CA, NV,SD,WY |
| 14 inch  | 2                | 1.38             | 1.38     | 1.38         |
| 16 inch  | 4                | 2.04             | 2.04     | 2.04         |
| 20 inch  | 6                | 2.75             | 2.75     | 2.75         |
| 25 inch  | 8                | 3.25             | 3.25     | 3.25         |

**Table 21 - Scrapers: Single engine conventional, diesel powered (includes EROPS):**

| Model                      | Capacity<br>CY | Hourly Rate (\$) |                |          |
|----------------------------|----------------|------------------|----------------|----------|
|                            |                | AZ,NM,UT         | CO,ID,KS,NE,NV | CA,SD,WY |
| Caterpillar 621G 15.7-22cy | 16-22          | 213.49           | 220.78         | 230.24   |
| Caterpillar 631G 24-34cy   | 24-34          | 302.41           | 312.70         | 326.05   |
| Caterpillar 651E 32-44cy   | 32-44          | 326.27           | 336.57         | 349.93   |

**Table 22 - Scrapers: Dual engine conventional, diesel powered (includes EROPS):**

| Model                    | Capacity | Hourly Rate (\$) |                |          |
|--------------------------|----------|------------------|----------------|----------|
|                          | CY       | AZ,NM,UT         | CO,ID,KS,NE,NV | CA,SD,WY |
| Caterpillar 637G 24-34cy | 24-34    | 419.47           | 433.01         | 450.57   |

**Table 23 - Signs, Message: trailer mounted, changeable "DOT"**

| Model       | Hourly Rate (\$) |             |             |
|-------------|------------------|-------------|-------------|
|             | AZ,NM,UT         | CO,ID,KS,NE | CA,NV,SD,WY |
| Solar       | 7.31             | 7.68        | 8.32        |
| Diesel 5 hp | 11.46            | 11.90       | 12.66       |

**Table 24 - Skidders, Cable:**

| Model                  | Engine | Hourly Rate (\$) |             |             |
|------------------------|--------|------------------|-------------|-------------|
|                        | HP     | AZ,NM,UT         | CO,ID,KS,NE | CA,NV,SD,WY |
| Caterpillar 525B 160hp | 160    | 113.00           | 113.00      | 113.00      |
| Deere 540G III 117 hp  | 117    | 87.26            | 87.26       | 87.26       |
| Caterpillar 535B 180hp | 180    | 125.33           | 125.33      | 125.33      |
| Deere 640G III 185 hp  | 185    | 121.45           | 121.45      | 121.45      |

**Table 25 - Skidders, Grapple:**

| Model                       | Grapple Opening | Engine | Hourly Rate (\$) |             |             |
|-----------------------------|-----------------|--------|------------------|-------------|-------------|
|                             | Inches          | HP     | AZ,NM,UT         | CO,ID,KS,NE | CA,NV,SD,WY |
| Deere 548G III 119hp 85"    | 85              | 119    | 91.84            | 91.84       | 91.84       |
| Caterpillar 525B 160hp 120" | 120             | 160    | 120.63           | 120.63      | 120.63      |
| Deere 648G III 163hp 115"   | 115             | 160    | 120.93           | 120.93      | 120.93      |
| Deere 748G III 171hp 125"   | 125             | 171    | 130.70           | 130.70      | 130.70      |

**Table 26 - Spreaders, Aggregate:**

| Model                                  | Width | Engine | Hourly Rate (\$) |             |             |
|--|-------|--------|------------------|-------------|-------------|
|  | Feet  | HP     | AZ,NM,UT         | CO,ID,KS,NE | CA,NV,SD,WY |
| Etnyre chip spreader 10' 152hp         | 10    | 152    | 86.22            | 87.99       | 91.03       |
| Rosco Spreadpro 16.5' 205hp            | 16.5  | 205    | 143.08           | 146.84      | 153.28      |
| Tail gate w/auger 8' gas engine - 18hp | 8     | 18     | 8.13             | 8.22        | 8.37        |
| Towed 7' w/auger gas engine - 7hp      | 7     | 7      | 4.86             | 4.94        | 5.08        |

Note: For tailgate or towed spreaders add in cost of dump truck

**Table 27 - Asphalt Pressure Distributor: Includes diesel powered truck with full circulating spray bar, heater, insulation, power takeoff unit, and tachometer.**

| Truck                                 | Capacity | Hourly Rate (\$) |                |                |
|---------------------------------------|----------|------------------|----------------|----------------|
|                                       | Gallons  | AZ, NM, UT       | CO, KS, NE, NV | CA, ID, SD, WY |
| 4x2 200hp 25,000 GVW - Diesel Flatbed | 1600     | 62.40            | 64.91          | 67.30          |
| 6x4 280hp 40,000 GVW - Diesel Flatbed | 3100     | 80.84            | 83.81          | 86.62          |
| 6x4 380hp 45,000 GVW - Diesel Flatbed | 4,000    | 99.09            | 102.53         | 105.74         |

**Table 28 - Tractors, Crawler: Power shift/torque converter, Blade, EROPS:**

| Model                              | Engine | Hourly Rate (\$) |                    |            |            |                    |            |
|------------------------------------|--------|------------------|--------------------|------------|------------|--------------------|------------|
|                                    | HP     | W/O Rippers      |                    |            | W/Rippers  |                    |            |
|                                    |        | AZ, NM, UT       | CO, ID, KS, NE, NV | CA, SD, WY | AZ, NM, UT | CO, ID, KS, NE, NV | CA, SD, WY |
| Caterpillar D3G XL 70HP            | 70     | 30.91            | 53.28              | 30.91      | 57.55      | 59.49              | 62.00      |
| Caterpillar D4G XL 80HP            | 80     | 34.21            | 59.38              | 34.21      | 63.44      | 65.59              | 68.37      |
| Caterpillar D5G XL 90HP            | 90     | 37.24            | 64.89              | 37.24      | 69.35      | 71.72              | 74.79      |
| Caterpillar D5N XL 120HP           | 120    | 45.54            | 78.39              | 45.54      | 82.46      | 85.22              | 88.80      |
| Caterpillar D6R SERIES II 165HP    | 165    | 56.93            | 105.86             | 56.93      | 111.41     | 115.52             | 120.86     |
| Caterpillar D7R DS SERIES II 240HP | 240    | 84.59            | 158.67             | 84.59      | 167.07     | 173.32             | 181.43     |
| Caterpillar D8R SERIES II 307HP    | 307    | 109.95           | 216.04             | 109.95     | 231.08     | 240.18             | 251.98     |
| Caterpillar D8R SERIES II 307HP    | 410    | 148.45           | 287.13             | 148.45     | 302.21     | 313.91             | 329.10     |
| Caterpillar D10R 574HP             | 574    | 190.85           | 371.68             | 190.85     | 387.92     | 403.05             | 422.67     |
| Caterpillar D11R 850HP             | 850    | 282.65           | 530.40             | 282.65     | 557.63     | 578.71             | 606.06     |

**Table 29 - Pickups and flatbeds:**

| Axle Configuration | Capacity    |             | Hourly Rate (\$) |          |
|--------------------|-------------|-------------|------------------|----------|
|                    | Cubic Yards | AZ,ID,NM,UT | CO,KS,NE,NV      | CA,SD,WY |
| 4x2                | 5-6         | 44.80       | 45.43            | 46.35    |
| 6x4                | 8-10        | 69.91       | 70.80            | 72.10    |
| 6x4                | 10-12       | 87.73       | 88.86            | 90.52    |
| 6x4                | 12-18       | 94.66       | 96.03            | 98.04    |

**Table 30 - Rear dump, highway type, diesel powered:**

| Axle Configuration | Capacity    |             | Hourly Rate (\$) |          |
|--------------------|-------------|-------------|------------------|----------|
|                    | Cubic Yards | AZ,ID,NM,UT | CO,KS,NE,NV      | CA,SD,WY |
| 4x2                | 5-6         | 44.80       | 45.43            | 46.35    |
| 6x4                | 8-10        | 69.91       | 70.80            | 72.10    |
| 6x4                | 10-12       | 87.73       | 88.86            | 90.52    |
| 6x4                | 12-18       | 94.66       | 96.03            | 98.04    |

**Table 31 - Water tankers, highway:**

| Fuel     | Capacity |             | Hourly Rate (\$) |          |
|----------|----------|-------------|------------------|----------|
|          | Gallons  | AZ,ID,NM,UT | CO,KS,NE,NV      | CA,SD,WY |
| Gasoline | 1500     | 47.36       | 47.90            | 48.69    |
| Gasoline | 2500     | 48.47       | 49.06            | 49.91    |
| Diesel   | 2500     | 36.49       | 37.11            | 38.02    |
| Diesel   | 3000     | 44.16       | 44.90            | 45.98    |
| Diesel   | 3500     | 57.84       | 58.74            | 60.06    |
| Diesel   | 4000     | 65.67       | 66.91            | 68.71    |

**Table 32 - Truck tractor w/single-gate belly dump trailer (tandem axle):**

| Capacity    |      | Hourly Rate (\$) |             |             |
|-------------|------|------------------|-------------|-------------|
| Cubic Yards | tons | AZ,NM,UT         | CO,ID,KS,NE | CA,NV,SD,WY |
| 18          | 27   | 96.97            | 98.75       | 101.40      |

**Table 33 - Water tankers, off highway, diesel:**

| Fuel   | Capacity | Hourly Rate (\$) |             |          |
|--------|----------|------------------|-------------|----------|
|        | Gallons  | AZ,ID,NM,UT      | CO,KS,NE,NV | CA,SD,WY |
| Diesel | 5000     | 84.26            | 86.00       | 88.53    |
| Diesel | 6000     | 145.34           | 148.10      | 152.12   |
| Diesel | 8000     | 214.91           | 219.26      | 225.61   |

**Table 34 - Truck tractor w/hydraulic gooseneck lowboy trailer (tandem axle):**

| Axle Configuration | Capacity<br>tons | Hourly Rate (\$) |             |             |
|--------------------|------------------|------------------|-------------|-------------|
|                    |                  | AZ,NM,UT         | CO,ID,KS,NE | CA,NV,SD,WY |
| 75,000 GVW Truck   | 35               | 99.77            | 101.63      | 104.42      |
| 75,000 GVW Truck   | 50               | 103.86           | 105.90      | 108.97      |

**Table 35 - Articulated Rear dump, diesel powered:**

| Model                         | Capacity    | Hourly Rate (\$) |             |          |
|-------------------------------|-------------|------------------|-------------|----------|
|                               | Cubic Yards | AZ,ID,NM,UT      | CO,KS,NE,NV | CA,SD,WY |
| CAT 725 6X6 14.5-18.8cy 301hp | 14.5-18.8   | 111.88           | 115.16      | 119.94   |
| CAT 730 6X6 17.1-22.1cy 317hp | 17.1-22.1   | 120.22           | 123.66      | 128.68   |
| CAT 735 6X6 19.3-25.8cy 419hp | 19.3-25.8   | 142.25           | 146.19      | 151.94   |
| CAT 740 6X6 22.8-30.0cy 453hp | 22.8-30.0   | 156.02           | 160.41      | 166.83   |

**Table 36 - Welders: Portable (diesel), mounted on skid:**

| Amps                       | Hourly Rate (\$) |            |                |
|----------------------------|------------------|------------|----------------|
|                            | AZ, ID, NM, UT   | CO, KS, NE | CA, NV, SD, WY |
| DC-CC 300 amp skid mounted | 8.73             | 8.80       | 8.90           |
| DC-CC 400 amp skid mounted | 12.09            | 12.18      | 12.31          |

**Table 37 - Brooms and Sweepers: Pull Type requires truck to pull (not included in costs below)**

| Type                                      | Width<br>Feet | Hourly Rate (\$) |                |                |
|---|---------------|------------------|----------------|----------------|
|   |               | AZ, NM, UT       | CO, ID, KS, NE | CA, NV, SD, WY |
| Pull Type traction driven 7' 84"          | 7             | 8.87             | 9.19           | 9.72           |
| Pull Type Engine driven (gas) 7' 84"      | 7             | 15.72            | 16.10          | 16.75          |
| Broce Self propelled diesel 8' 96" RC-350 | 8             | 30.08            | 30.59          | 31.46          |
| Broce Self propelled diesel 8' 96" RJ-350 | 8             | 30.80            | 31.30          | 32.17          |

**Table 38 – Brush Chippers: Trailer mounted:**

| Model                              | Max Log Diameter<br>Inches | Hourly Rate (\$) |                |                |
|------------------------------------|----------------------------|------------------|----------------|----------------|
|                                    |                            | AZ, NM, UT       | CO, ID, KS, NE | CA, NV, SD, WY |
| Mitts & Merrill K12F6 8" gas 125HP | 8                          | 46.74            | 46.74          | 46.74          |
| Bandit 200 XP 12" diesel 99HP      | 12                         | 45.27            | 45.27          | 45.27          |
| Bandit 280 XP 18" diesel 114HP     | 18                         | 58.63            | 58.63          | 58.63          |
| Bandit 150 XP 12" diesel 115HP     | 12                         | 50.04            | 50.04          | 50.04          |
| Bandit 280 XP 18" diesel 142HP     | 18                         | 63.99            | 63.99          | 63.99          |

**Table 39 – Brush Cutters: Rubber tired, diesel:**

| Model                         | Cutter Width<br>Feet | Hourly Rate (\$) |                |                |
|-------------------------------|----------------------|------------------|----------------|----------------|
|                               |                      | AZ, NM, UT       | CO, ID, KS, NE | CA, NV, SD, WY |
| Kershaw 800-2 8' Cutter 185HP | 8                    | 156.84           | 156.84         | 156.84         |
| Kershaw 1200 10' Cutter 225HP | 10                   | 177.67           | 177.67         | 177.67         |



## **Appendix B Suppliers**



Lists of suppliers are provided for a starting reference only and are listed in alphabetical order. Companies may not use this list for advertising or promotional purposes. These lists are not an endorsement of any product or firm by the USDA or Forest Service.

**Table 1: Slope Reinforcement and Retaining Wall Suppliers**

|                               |  |  |  |   |
|-------------------------------|--|--|--|---|
| Buildology, Inc.              | 3601 Pan American NE<br>Albuquerque, NM 87107                                  | 505-344-6626                                     | <a href="http://www.buildologyinc.com">www.buildologyinc.com</a>                     | Tim Hooper  |
| Contech Construction Products | Salt Lake City, UT<br>Portland, OR<br>Greenwood Village, CO<br>Albuquerque, NM | 509-542-8644<br>720-587-2700                     | <a href="http://www.contech-cpi.com">www.contech-cpi.com</a>                         |   |
| Geo Products                  | 8615 Goldon Spike Ln<br>Houston, TX 77086                                      | 281-820-5493                                     | <a href="http://www.geoproducts.org">www.geoproducts.org</a>                         | Al Florez   |
| GeoCell Systems, Inc.         | P.O. Box 2088<br>Mountain View, CA 94042                                       | 415-541-5300                                     | <a href="http://www.geocellsystems.com">www.geocellsystems.com</a>                   | Al Arellanes                                      |
| GeoStabilization, Inc.        | PO Box 4709<br>Grand Jct., CO 81502  | 970-263-9154                                     | <a href="http://www.geostabilization.com">www.geostabilization.com</a>               | Cameron Lobato<br>Matt Birchmier<br>Colby Barrett |
| Hilfiker Retaining Walls      | 1902 Hilfiker Lane<br>Eureka, CA 95503-5711                                    | 800-762-8962<br>707-443-5093                     | <a href="http://www.hilfiker.com">www.hilfiker.com</a>                               | Harold or Bill<br>Hilfiker                        |
| J-H Supply, Inc.              | 2132 Osuna Rd. NE #A<br>Albuquerque, NM 87113                                  | 505-344-6006                                     |  | Jerry   |
| Maccaferri Gabions            | 8651 Morrison Creek Drive<br>Sacramento, CA 95828                              | 916-371-5805<br>800-328-5805<br>PHX 602-246-9071 | <a href="http://www.maccaferri-northamerica.com">www.maccaferri-northamerica.com</a> | Jeff Palmer                                       |
| Modular Gabion Systems        | C. E. Shepherd Co., L.P.<br>2221 Canada Dry St.<br>Houston, TX                 | 800-324-8282                                     | <a href="http://www.gabions.net">www.gabions.net</a>                                 | Ryan Barfield                                     |

|  |  |                               |  |                                   |
|--|--|-------------------------------|--|-----------------------------------|
| Soil Stabilization Products Co. (EMC2) | PO Box 2779<br>Merced, CA 95344                              | 800-523-9992<br>209-383-3296  | <a href="http://www.sspco.org">www.sspco.org</a>                 | Samuel<br>Randolph<br>Joe Phillip |
| Terra Aqua Inc.                        | 1415 North 32nd Street<br>Fort Smith AR 72904<br>and Reno NV | 775-828-1390<br>800 -736-9089 | <a href="http://www.terraaqua.com">www.terraaqua.com</a>         | Noel Cline                        |
| US Fabrics Inc.                        | 3904 Virginia Ave.<br>Cincinnati, OH 45227                   | 800-518-2290                  | <a href="http://www.usfabricsinc.com">www.usfabricsinc.com</a>   | Dan Bonn                          |
| Vance Bros., Inc.                      | 380 W. 62 <sup>nd</sup> Ave.<br>Denver, CO 80216             | 303-341-2604<br>800-821-8549  | <a href="http://www.vancebrothers.com">www.vancebrothers.com</a> | Chris Lee                         |

See Sections 253, 255, 257, and 262 for details.

**Table 2: Magnesium Chloride Suppliers**

| <b>Name</b>                 | <b>Address</b>   | <b>Phone</b>                 | <b>Website</b>   | <b>Contact</b>   |
|-----------------------------|--|------------------------------|--|--|
| Atlas Sand and Rock         | 4341 Snake River Ave.<br>Lewiston, ID 83501                  | 208-743-5596                 |  | Brad Hauser  |
| Desert Mountain Corporation | P.O. Box 1633<br>Kirtland, NM. 87417                         | 800-375-9264                 | <a href="http://www.desertmtncorp.com">www.desertmtncorp.com</a>               | Local Supplier<br>contacts on<br>website or<br>Lynn James                    |
| Envirotech                  | 910 54th Avenue, Suite 230<br>Greeley, CO 80634              | 800-369-3878<br>970-346-3900 | <a href="http://www.envirotechservices.com">www.envirotechservices.com</a>     | <a href="mailto:info@envirotechservices.com">info@envirotechservices.com</a> |
| Hill Brothers Chemical Co.  | 75 N. 640 W.<br>N. Salt Lake, UT 84054<br>Plant - Rowley, UT | 800-994-8801                 | <a href="http://www.hillbrothers.com">www.hillbrothers.com</a>                 | Jeff Greenburg   |
| Hyland Enterprises, Inc.    | 3770 Puritan Way, Unit E<br>Frederick, CO 80516              | 970-257-6181<br>307-328-0668 | <a href="http://www.hylandenterprisesinc.com">www.hylandenterprisesinc.com</a> | Doug Freeman   |

| <b>Name</b>                | <b>Address</b>  | <b>Phone</b>                 | <b>Website</b>   | <b>Contact</b> |
|----------------------------|---|------------------------------|--|----------------|
| Lyman Dust Control         | P.O. Box 1460<br>Hayden, ID 83835-1460                  | 800-952-6457                 | <a href="http://www.lymandustcontrol.com">www.lymandustcontrol.com</a> | Jerry Lyman    |
| North American Salt        | 9900 W. 109th St., Suite 600<br>Overland Park, KS 66210 | 913-344-9200<br>800-323-1641 | <a href="http://www.nasalt.com">www.nasalt.com</a>                     | Jason Bagely   |
| Z & S Dust Control Systems | 22470 Bennet Road<br>Rapid city, SD 57701               | 605-341-1440                 | <a href="http://www.zandsdustcontrol.com">www.zandsdustcontrol.com</a> |                |

See Section 306 for details.

**Table 3: Lignin Sulfonate Suppliers**

| <b>Name</b>   | <b>Address</b>                        | <b>Phone</b> | <b>Website</b>   | <b>Contact</b>   |
|---|---------------------------------------|--------------|--|--|
| Desert Mountain Corporation   | P.O. Box 1633<br>Kirtland, NM. 87417  | 800-375-9264 | <a href="http://www.desertmtncorp.com">www.desertmtncorp.com</a> | Local Supplier<br>contacts on<br>website or<br>Emil Mead |
| Georgia-Pacific West, Inc. (No<br>longer have Lignin, carry<br>Talon) | P.O. Box 1236<br>Bellingham, WA 98227 | 866-447-2436 | <a href="http://www.gp.com/chemicals">www.gp.com/chemicals</a>   | Connie Darrels   |

See Section 306 for details.

**Table 4: Calcium Chloride Suppliers**

| <b>Name</b>                 | <b>Address</b>                       | <b>Phone</b> | <b>Website</b>   | <b>Contact</b>  |
|-----------------------------|--------------------------------------|--------------|--|---|
| Desert Mountain Corporation | P.O. Box 1633<br>Kirtland, NM. 87417 | 800-375-9264 | <a href="http://www.desertmtncorp.com">www.desertmtncorp.com</a> | Local Supplier<br>contacts on<br>website or<br>Lynn James |

| <b>Name</b>                  | <b>Address</b>   | <b>Phone</b>                 | <b>Website</b>   | <b>Contact</b> |
|------------------------------|--|------------------------------|--|----------------|
| Hill Brothers Chemical Co.   | 75 N. 640 W.<br>N. Salt Lake, UT 84054<br>Plant - Rowley, UT | 800-336-3911                 | <a href="http://www.hillbrothers.com">www.hillbrothers.com</a>   | Jeff Greenburg |
| Hyland Enterprises, Inc.     | 3770 Puritan Way, Unit E<br>Frederick, CO 80516              | 970-257-6181<br>307-328-0668 | <a href="http://www.hylandenterprisesinc.com">www.hylandenterprisesinc.com</a>   | Doug Freeman   |
| Tetra Technologies           | 24955 Interstate 45 North<br>The Woodlands, Texas 77380      | 800-327-7817 x350            | <a href="http://www.tetrachemicals.com/products/calcium_chloride/">www.tetrachemicals.com/products/calcium_chloride/</a> | John May       |
| Tiger Calcium Services, Inc. | 2220 Broadmoor Blvd.<br>Sherwood Park, AB T8H 1B4<br>Canada  | 780-464-4871<br>800-661-4298 | <a href="http://www.tigercalcium.com">www.tigercalcium.com</a>   | Clark Sazwan   |
| Ward Chemical                | 6015 - 103A Street<br>Edmonton, Alberta, Canada<br>T6H 2J7   | 780-940-1133<br>780-436-4832 | <a href="http://www.wardchem.com">www.wardchem.com</a>   | Al Korchinski  |

See Section 306 for details.

**Table 5: Bentonite Suppliers**

| <b>Name</b>                                | <b>Address</b>                                 | <b>Phone</b>                 | <b>Website</b>   | <b>Contact</b>      |
|--|--|------------------------------|--|---------------------|
| American Colloid                           | Lovell, WY                                     | 800-322-1159                 | <a href="http://www.americancolloid.com">www.americancolloid.com</a> |                     |
| Bentonite Performance Minerals (BPM), Inc. | 410 17th Street, Suite 800<br>Denver, CO 80202 | 281-871-7900<br>303-571-8240 | <a href="http://www.bentonite.com">www.bentonite.com</a>             | Charles<br>McAughan |
| Black Hills Bentonite                      | Box 9<br>Mills, WY 82644                       | 307-265-3740                 | <a href="http://www.bhbentonite.com">www.bhbentonite.com</a>         | Tom Thorson         |
| Central Oregon Bentonite                   | 50500 SE Camp Creek Rd<br>Prineville, OR 97754 | 541-477-3351                 |  | Carl Weaver         |

| <b>Name</b>                    | <b>Address</b>                                  | <b>Phone</b>                 | <b>Website</b>   | <b>Contact</b> |
|--------------------------------|---|------------------------------|--|----------------|
| Hyland Enterprises, Inc.       | 3770 Puritan Way, Unit E<br>Frederick, CO 80516 | 970-257-6181<br>307-328-0668 | <a href="http://www.hylandenterprisesinc.com">www.hylandenterprisesinc.com</a>   | Doug Freeman   |
| Wyoming Bentonite<br>(Wyo-Ben) | 1345 Discovery Drive<br>Billings, MT 59102      | 406-652-6351                 | <a href="http://www.wyoben.com">www.wyoben.com</a>                               |                |
| Teague Mineral Products        | 1925 Highway 201<br>Adrian, OR 97901            | 541-339-3940                 | <a href="http://www.teaguemineralproducts.com">www.teaguemineralproducts.com</a> | April Teague   |

See Section 303 for details.

There is also the USGS publication "Directory of Companies Mining Specialty Clays in the United States In 2000" located at:  
<http://minerals.usgs.gov/minerals/pubs/commodity/clays/190200.pdf>

**Table 6: Asphalt Suppliers**

| <b>Name</b>  | <b>Address</b>                                      | <b>Phone</b> | <b>Website</b>   | <b>Contact</b> |
|--|---|--------------|--|----------------|
| Emery Brothers   | 21357 Highway 30<br>Filer, ID                       | 208-733-3951 |  |                |
| Frontier Refining                                      | 300 Morrie Ave<br>PO Box 1588<br>Cheyenne, WY 82007 | 307-634-3551 | <a href="http://www.frontieroil.com/en/cms/?2209">www.frontieroil.com/en/cms/?2209</a> | Tom Johnson    |
| Golden Bear Oil Specialties –<br>Now Tricor Refineries | P.O. Box 5877<br>Bakersfield, CA 93388-5877         | 661-393-7110 |  |                |
| Hills Materials Company                                | 3975 Sturgis Road<br>Rapid City, SD 57702           | 605-394-3300 | <a href="http://www.hillsmaterials.com">www.hillsmaterials.com</a>                     |                |

| <b>Name</b>                                | <b>Address</b>   | <b>Phone</b>   | <b>Website</b>   | <b>Contact</b>                                      |
|--|--|--|--|---|
| Holly Asphalt<br>now → NK Asphalt Partners | <b>Woods Cross Refining</b><br>Woods Cross, UT 84087                                       | 575-748-1368<br>505-761-5578<br>801-298-4059<br>801-299-6689                 | <a href="http://www.hollycorp.com">www.hollycorp.com</a>                     | Diana Reed<br>Fred Dunbar<br>Matt Graham            |
| Idaho Asphalt Supply                       | 2535 North 15th East<br>Idaho Falls, ID 83401  | 208-524-5871   | <a href="http://www.idahoasphalt.com">www.idahoasphalt.com</a>               |   |
| Jebro, Inc                                 | Cheyenne, WY   | 800-831-8037   | <a href="http://www.jebro.com/AFS_index.htm">www.jebro.com/AFS_index.htm</a> | Val Miller<br>Noel Schulz                           |
| Montana Refining                           | 1900 10th Street NE<br>Great Falls, MT 59404   | 406-761-4100   | <a href="http://www.montanarefining.com">www.montanarefining.com</a>         |   |
| Sinclair Oil                               | PO Box 30825<br>Salt Lake City, UT 84130   | 801-524-2700   | <a href="http://www.sinclairoil.com">www.sinclairoil.com</a>                 | Craig Menees  |
| Suncor Energy Corp.                        | Greenwood Village, CO<br>Grand Junction, CO<br>Woods Cross, UT<br>Boise, ID<br>Spokane, WA | 303-796-2688<br>970-241-1135<br>801-295-3489<br>208-345-2538<br>509-487-4560 | <a href="http://www.semmaterials.com">www.semmaterials.com</a>               | Norb<br>Schreiber(DEN)<br>or local plant<br>manager |

See Section 400, 403, 409, 410 etc. for details.

**Table 7: Clarified Dust Oil D0-4 Suppliers**

| <b>Name</b>               | <b>Address</b>                                | <b>Phone</b> | <b>Website</b>   | <b>Contact</b> |
|---------------------------|---|--------------|--|----------------|
| Idaho Asphalt Supply Inc. | 2535 North 15th East<br>Idaho Falls, ID 83401 | 208-524-5871 | <a href="http://www.idahoasphalt.com">www.idahoasphalt.com</a> |                |

See Section 400, 403, 409, 410 etc. for details.

**Table 8: Enzyme and Resin Suppliers**

| <b>Name</b>                               | <b>Address</b>                     | <b>Phone</b>                 | <b>Website</b>                                   | <b>Contact</b>                    |
|---|------------------------------------|------------------------------|--|-----------------------------------|
| Idaho Enzymes, Inc.                       | 1010 West Main<br>Jerome, ID 83338 | 208-324-3642                 |  |                                   |
| Soil Stabilization Products Co.<br>(EMC2) | PO Box 2779<br>Merced, CA 95344    | 800-523-9992<br>209-383-3296 | <a href="http://www.sspco.org">www.sspco.org</a> | Samuel<br>Randolph<br>Joe Phillip |

See Section 400, 403, 409, 410 etc. for details.

**Table 9: Plastic Pipe Suppliers**

| <b>Name</b>                      | <b>Address</b>   | <b>Phone</b>                 | <b>Website</b>   | <b>Contact</b> |
|----------------------------------|--|------------------------------|--|----------------|
| Advanced Drainage Systems        | 240 N. 400 W.<br>PO Box 540356<br>N. Salt Lake City 84054                      | 800-821-6710<br>801-296-2055 | <a href="http://www.ads-pipe.com">www.ads-pipe.com</a>   |                |
| Contractor's Supply, Inc         | 5005 Rourke Ave<br>Gillette, WY 82718  | 307-682-5153<br>800-284-8182 |  |                |
| Contech Construction<br>Products | Salt Lake City, UT<br>Portland, OR<br>Greenwood Village, CO<br>Albuquerque, NM | 509-542-8644<br>720-587-2700 | <a href="http://www.contech-cpi.com/Products/Pipe/High-Density-Polyethylene-HDPE.aspx">www.contech-cpi.com/Products/Pipe/High-Density-Polyethylene-HDPE.aspx</a> |                |
| Field Lining Systems             | 439 S. 3rd Ave.<br>Avondale, AZ 85323  | 888-382-9301<br>623-842-1255 | <a href="http://www.fieldliningsystems.com">www.fieldliningsystems.com</a>   |                |
| GJ Pipe & Supply                 | 2868 I-70 Business Loop<br>Grand Junction, CO                                  | 970-243-4604<br>800-748-1564 | <a href="http://www.gjpipe.com">www.gjpipe.com</a>   |                |
| Northwest Pipe Fittings, Inc     | PO Box 920<br>Rapid City, SD 57702   | 605-342-5587                 | <a href="http://www.northwestpipe.net">www.northwestpipe.net</a>   | Terry Weber    |

See Section 602 for details.

**Table 10: Metal Pipe Suppliers**

| <b>Name</b>                                      | <b>Address</b>   | <b>Phone</b>                                 | <b>Website</b>   | <b>Contact</b> |
|--|--|--|--|----------------|
| Ace Steel and Recycling                          | 2830 Elgin Street<br>Rapid city, SD 57703                                      | 605-342-8649                                 | <a href="http://www.acesteelusa.com">www.acesteelusa.com</a>   |                |
| Big "R" Manufacturing & Distribution, Inc        | PO Box 1290<br>Greeley, CO 80632   | 800-234-0734                                 | <a href="http://www.bigrmfg.com/products/steelpipe/">www.bigrmfg.com/products/steelpipe/</a>   |                |
| Central Culvert Supply                           | 3150 Airport Road,<br>Pierre, SD 57501   | 605-224-5222                                 |  |                |
| Contech Construction Products                    | Salt Lake City, UT<br>Portland, OR<br>Greenwood Village, CO<br>Albuquerque, NM | 509-542-8644<br>720-587-2700                 | <a href="http://www.contech-cpi.com/Products/Pipe/Corrugated-Metal-CMP.aspx">www.contech-cpi.com/Products/Pipe/Corrugated-Metal-CMP.aspx</a> |                |
| GJ Pipe & Supply                                 | 2868 I-70 Business Loop<br>Grand Junction, CO                                  | 970-243-4604<br>800-748-1564                 | <a href="http://www.gjpipe.com">www.gjpipe.com</a>   |                |
| Huron Culvert and Tank (True North Steel)        | 3272 Lien Street<br>Rapid City, SD 57702                                       | 605-394-7200                                 | <a href="http://www.truenorthsteel.com">www.truenorthsteel.com</a>   |                |
| Roscoe Steel & Culvert<br>Now → True North Steel | Billings, MT<br>Missoula, MT<br>Casper, WY                                     | 406-656-2253<br>406-532-7122<br>307-472-7121 | <a href="http://www.roscoesteel.com/contact.html">www.roscoesteel.com/contact.html</a>   |                |
| Wells Plumbing                                   | 1700 5 <sup>th</sup> ave<br>Belle Fourche, SD 57717                            | 605-8922613                                  |  |                |

See Section 602 for details.

**Table 11: Manholes, Inlets, And Catch Basin Suppliers**

| <b>Name</b>              | <b>Address</b>                                | <b>Phone</b>                 | <b>Website</b>   | <b>Contact</b> |
|--------------------------|---|------------------------------|--|----------------|
| GJ Pipe & Supply         | 2868 I-70 Business Loop<br>Grand Junction, CO | 970-243-4604<br>800-748-1564 | <a href="http://www.gjpipe.com">www.gjpipe.com</a>         |                |
| CRETEX Concrete Products | 2046 Samco Rd. Ste. 2<br>Rapid City, SD 57702 | 605-718-4111<br>605-343-1450 | <a href="http://www.cretexwest.com">www.cretexwest.com</a> |                |

See Section 604 for details.

**Table 12: Underdrains, Sheet Drains, And Pavement Edge Drain Suppliers**

| <b>Name</b>                   | <b>Address</b>   | <b>Phone</b>                 | <b>Website</b>   | <b>Contact</b> |
|-------------------------------|--|------------------------------|--|----------------|
| Advanced Drainage Systems     | 240 N. 400 W.<br>PO Box 540356<br>N. Salt Lake City 84054                      | 800-821-6710<br>801-296-2055 | <a href="http://www.ads-pipe.com">www.ads-pipe.com</a>   |                |
| Contech Construction Products | Salt Lake City, UT<br>Portland, OR<br>Greenwood Village, CO<br>Albuquerque, NM | 509-542-8644<br>720-587-2700 | <a href="http://www.contech-cpi.com/drainage/products_materials/128">www.contech-cpi.com/drainage/products_materials/128</a> |                |
| Master Distributors           | 1600 W. 13th Ave.<br>Denver, CO 80204  | 303 595-8722                 | <a href="http://www.drainage-eljen.com">www.drainage-eljen.com</a>   | Rich Minter    |
| Nilex Corporation             | 15253 E. Fremont Dr.<br>Centennial, CO 80112                                   | 303-766-2000                 | <a href="http://www.nilex.com">www.nilex.com</a>   |                |
| US Fabrics                    | 3904 Virginia Ave<br>Cincinnati, OH 45227                                      | 800-518-2290                 | <a href="http://www.usfabricsinc.com">www.usfabricsinc.com</a>   | Dan Bonn       |

See Section 605 for details.

**Table 13: Guardrail Suppliers**

| <b>Name</b>               | <b>Address</b>   | <b>Phone</b>                 | <b>Website</b>  | <b>Contact</b> |
|---------------------------|--|------------------------------|---|----------------|
| Adarand Constructors      | 2720 E. Las Vegas, Suite 200<br>Colorado Springs, CO 80906 | 719-390-4000 x213            | <a href="http://adarand.com/materials_sales.html">http://adarand.com/materials_sales.html</a> |                |
| Coral Sales Company       | PO Box 22385<br>Milwaukie, OR 97269                        | 800 538-7245                 | <a href="http://www.coralsales.com">www.coralsales.com</a>                                    |                |
| J-H Supply, Inc.          | 2132 Osuna Rd. NE #A<br>Albuquerque, NM 87113              | 505-344-6006                 |   |                |
| SAN BAR Construction Corp | 9101 Broadway<br>Albuquerque, NM 87105                     | 505-452-8000                 | <a href="http://www.sanbarcc.com">www.sanbarcc.com</a>  | Brad Barger    |
| Trinity Highway Products  | P.O. Box 99<br>Centerville, UT 84014                       | 801-292-4461<br>800-772-7976 | <a href="http://www.highwayguardrail.com">www.highwayguardrail.com</a>                        |                |

See Section 617 for details.

**Table 14: Concrete Barrier Suppliers**

| <b>Name</b>              | <b>Address</b>  | <b>Phone</b>                 | <b>Website</b>   | <b>Contact</b> |
|--------------------------|---|------------------------------|--|----------------|
| CRETEX Concrete Products | 2046 Samco Rd. Ste. 2<br>Rapid City, SD 57702         | 605-718-4111<br>605-343-1450 | <a href="http://www.cretexwest.com">www.cretexwest.com</a>                     |                |
| Discount Crowd Control   | 23600 College Blvd Ste # 202<br>Olathe, KS 66061-8770 | 866-755-3325                 | <a href="http://www.discountcrowdcontrol.com">www.discountcrowdcontrol.com</a> |                |
| Materials, Inc.          | 318 S. Hill Rd.<br>Bernalillo, NM 87004               | 505-867-9035                 |  |                |
| SEMA Precast, Inc.       | 7353 South Eagle Street,<br>Englewood, CO 80112-4223  | 303-627-2600                 | <a href="http://www.semaconstruction.com">www.semaconstruction.com</a>         |                |

See Section 618 for details.

**Table 15: Fencing, Gates & Cattleguard Suppliers**

| <b>Name</b>  | <b>Address</b>   | <b>Phone</b>                 | <b>Website</b>   | <b>Contact</b> |
|--|--|------------------------------|--|----------------|
| Big "R" Manufacturing and Distribution, Inc                      | PO Box 1290<br>Greeley, CO 80632                       | 970-356-9600<br>800-234-0734 | <a href="http://www.bigrmfg.com/products/cattleguards/">www.bigrmfg.com/products/cattleguards/</a> |                |
| Colorado Correctional Industries<br>(Colo. Dept. of Corrections) | P.O. Box 1600<br>Cañon Complex<br>Cañon City, CO 81215 | 719-269-4540<br>800-685-7891 |  |                |
| Cow Country Equipment  | 4501 S. I-90 Service Road<br>Rapid City, SD 57703      | 605-342-8258                 |  |                |
| Pavement Markings Northwest                                      | 4850 Henry St.<br>Boise, ID                            | 208-388-8858                 |  |                |
| Powder River   | 388 E. 900 S.<br>P.O. Box 50758<br>Provo, UT 84605     | 801-374-2983<br>800-453-5318 | <a href="http://www.powderriver.com">www.powderriver.com</a>                                       |                |
| WW Cattle Guards, LLC  | 5742 Webb Dr.<br>Lakeside, AZ 85929                    | 928-537-3125                 |  | Bob Sebring    |

See Section 619 for details.

**Table 16: Rolled Erosion Control Products & Cellular Confinement System Suppliers**

| <b>Name</b>          | <b>Address</b>                                       | <b>Phone</b> | <b>Website</b>   | <b>Contact</b> |
|----------------------|--|--------------|--|----------------|
| Geo Products         | 8615 Goldon Spike Ln<br>Houston, TX 77086            | 281-820-5493 | <a href="http://www.geoproducts.org">www.geoproducts.org</a> | Al Florez      |
| North American Green | 5401 St. Wendel-Cynthiana Rd<br>Poseyville, IN 47633 | 800-722-2040 | <a href="http://www.nagreen.com">www.nagreen.com</a>         |                |

| <b>Name</b>     | <b>Address</b>  | <b>Phone</b> | <b>Website</b>   | <b>Contact</b> |
|-----------------|---|--------------|--|----------------|
| RoLanka         | 155 Andrew Drive,<br>Stockbridge, GA 30281<br><br>2759 NE Riverside Way<br>Portland, OR 97211 | 800-760-3215 | <a href="http://www.rolanka.com">www.rolanka.com</a>     |                |
| Terra Tech, LLC | 2635 W. 7th Place,<br>Eugene, OR. 97402   | 800-321-1037 | <a href="http://www.terratech.net">www.terratech.net</a> |                |

See Section 629 for details.

**Table 17: Permanent Traffic Control Material Suppliers**

| <b>Name</b>                  | <b>Address</b>                                | <b>Phone</b>                      | <b>Website</b>   | <b>Contact</b> |
|------------------------------|---|-----------------------------------|--|----------------|
| Action Safety Supply         | 700 Haines Ave NW<br>Albuquerque, NM          | 505-878-9690                      |  |                |
| Billings Construction Supply | 5514 King avenue East<br>Billings, MT 59108   | 406-248-8355<br>406-248-6470(fax) | <a href="http://www.billingsconstructionsupply.com">www.billingsconstructionsupply.com</a> |                |
| Centerline Supply - West     | 1301 E. Hadley Street<br>Phoenix, AZ 85034    | 888-399-7911                      | <a href="http://www.centerlinesupply.com">www.centerlinesupply.com</a>                     | Billy McDaniel |
| Coral Sales Company          | PO Box 22385<br>Milwaukie, OR 97269           | 800 538-7245                      | <a href="http://www.coralsales.com">www.coralsales.com</a>                                 |                |
| Idaho Traffic Safety         | 3400 E. Sunnyside St.<br>Ammon, ID 83406      | 208-522-4470                      |  |                |
| J-H Supply, Inc.             | 2132 Osuna Rd. NE #A<br>Albuquerque, NM 87113 | 505-344-6006                      |  |                |
| Jordan River Galvanizing     | 5447 Axel Park Road<br>Jordan River, UT 84088 | 801-282-9375                      | <a href="http://www.jrgalv.com/">www.jrgalv.com/</a>                                       |                |

| <b>Name</b>                             | <b>Address</b>                              | <b>Phone</b>             | <b>Website</b>  | <b>Contact</b>       |
|---|---|--------------------------|---|----------------------|
| Newman Signs                            | 1606 6th Ave SW<br>Jamestown, ND 58402      | 800-437-9770             | <a href="http://www.newmansigns.com">www.newmansigns.com</a>  |                      |
| Pavement Markings Northwest             | 4850 Henry St.<br>Boise, ID                 | 208-388-8858             |   |                      |
| PermaLetter Sign Co.                    | 1105 4th Ave. N.<br>Billings, MT 59101      | 406-252-1102             | <a href="http://www.permaletter.com">www.permaletter.com</a>  | Ronald A.<br>Bachman |
| SAN BAR Construction Corp               | 9101 Broadway<br>Albuquerque, NM 87105      | 505-452-8000             | <a href="http://www.sanbarcc.com">www.sanbarcc.com</a>  | Brad Barger          |
| Stonehouse Signs<br>(GSA: GS-07F-5550P) | 5550 W 60th Avenue<br>Arvada, CO 80003      | 800-525-0456<br>Ext. 205 | <a href="http://www.stonehousesigns.com">www.stonehousesigns.com</a>  | Mike Palmer          |
| Summit Signs & Supplies                 | 2340 Deadwood Ave<br>Rapid City, SD 57702   | 605-342-8303             |   |                      |
| TAPCO                                   | 5100 Brown Deer Rd.<br>Brown Deer, WI 53223 | 800-236-0112             | <a href="http://www.tapconet.com">www.tapconet.com</a>  |                      |
| UNICOR Sign Factory                     | 9595 W. Quincy Ave<br>Littleton, CO 80123   | 303-763-2588             | <a href="http://www.unicor.gov/shopping/viewCat_M.asp?iStore=IPG&amp;idCategory=415">http://www.unicor.gov/shopping/viewCat_M.asp?iStore=IPG&amp;idCategory=415</a> | Karla<br>Kunsemiller |

See Section 633 for details.

**Table 18: Permanent Pavement Marking Suppliers**

| <b>Name</b>              | <b>Address</b>                             | <b>Phone</b> | <b>Website</b>   | <b>Contact</b> |
|--------------------------|--|--------------|--|----------------|
| Idaho Traffic Safety     | 3400 E. Sunnyside St.<br>Ammon, ID 83406   | 208-522-4470 |  |                |
| Centerline Supply - West | 1301 E. Hadley Street<br>Phoenix, AZ 85034 | 888-399-7911 | <a href="http://www.centerlinesupply.com">www.centerlinesupply.com</a> | Billy McDaniel |

| <b>Name</b>                 | <b>Address</b>                                | <b>Phone</b> | <b>Website</b>   | <b>Contact</b> |
|-----------------------------|---|--------------|--|----------------|
| J-H Supply, Inc.            | 2132 Osuna Rd. NE #A<br>Albuquerque, NM 87113 | 505-344-6006 |  |                |
| Pavement Markings Northwest | 4850 Henry St.<br>Boise, ID                   | 208-388-8858 |  |                |
| TAPCO                       | 5100 Brown Deer Rd.<br>Brown Deer, WI 53223   | 800-236-0112 | <a href="http://www.tapconet.com">www.tapconet.com</a> |                |

See Section 634 for details.

**Table 19: Road Closure Device Suppliers**

| <b>Name</b>                                 | <b>Address</b>  | <b>Phone</b>                 | <b>Website</b>   | <b>Contact</b> |
|---|---|------------------------------|--|----------------|
| Big "R" Manufacturing and Distribution, Inc | PO Box 1290<br>Greeley, Colorado 80632                | 800-234-0734                 | <a href="http://www.bigrmfg.com">www.bigrmfg.com</a>         |                |
| Cow Country Equipment                       | 4501 S. Interstate 90 Service<br>Rapid City, SD 57703 | 605-342-8258                 |  |                |
| Powder River Co.                            | 388 E. 900 S.,<br>P.O. Box 50758<br>Provo, Utah 84605 | 801-374-2983<br>800-453-5318 | <a href="http://www.powderriver.com">www.powderriver.com</a> | Ross Gull      |
| WW Cattle Guards, LLC                       | Route 4, Box 1756<br>Lakeside, AZ 85929               | 520-537-3125<br>800-845-3234 |  | Bob Sebring    |

See Section 650 for details