

PROJECT REQUIREMENTS

Project Requirements

SECTION 151 - MOBILIZATION (Labor 20-40 percent)

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

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

Use 7.0 percent for *contracts between \$100,000 and \$500,000* in Idaho and Montana and round to *two or three significant figures* (i.e. if calculation is \$8,234.56, round off to \$8,200 or \$8,250). Additional allowances for moving in and out of specialized equipment (rock crusher, paving equipment, etc.), should be made under this pay item up to the point that it equals 10% of the total Engineer's Estimate. See Example 2 for details.

For *contracts under \$100,000*, and for more complex projects (aggregate, paving, etc.) the actual costs should be estimated based upon moving normal components of machinery, personnel, etc., to/ from the project, and the number of seasons for the operation. For actual costs use \$3.00 a loaded mile per load. *Round off* calculated cost to two or three significant figures (see note above).

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

Example 1: Location - Montana Zone 1

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

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

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

Mobilization should not exceed 10% of \$126,700, or \$12,700 (rounded), so place \$12,700 under Section 151 and \$4,000 under Section 301.

SECTION 152 - CONSTRUCTION SURVEY AND STAKING (Contract Item)

The estimator is reminded of the Regional policy, per FSM 7720 supplements, that engineers/ surveyors involved in P-line surveys and design of Forest development roads or those under permit be licensed to practice in the State where the project is located. Also, on timber sales with purchaser survey and/ or design requirements, the estimator should check C provisions for survey dates, type, etc.

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Road Location.

There are no recent cost for this item at the present time.

Preliminary Survey.

Costs for negotiated A/ E contracts range from \$850/ mile for surveys of low-standard new roads (raw land) in open, easily accessible terrain, to \$3500/ mile for surveys of existing roads proposed for high-standard reconstruction. P-Line costs are generally dependent on survey standards, project access (drive, walk, camp, etc), terrain, vegetation density and time schedule. Establishment of spike camps can add costs to a project, long walks or difficult vehicle access can also increase the survey costs.

Recently, the average cost of all P-Line A/ E surveys (new and reconstruction) is about \$2,500-\$4,000/ mile. Detailed surveys of existing roads generally run higher than new construction due to the presence of cut/ fill slopes, culverts, and other features. **If data entry of survey notes and plotting of profile, traverse, and X-sections are desired, add \$500/mile.** Reestablishment of old P-Line can be estimated to cost about \$400/ mile.

Most contracts had some Medium Accuracy Standard survey, but were predominately Low Accuracy Standard survey. (Refer to FSH 7709.56, pg 3.9--2 for standards.)

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

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

Wages and Per Diem

<u>Fieldwork</u>	<u>Per Hour</u>	<u>Per day</u>
Two-person field party	\$110	\$880
Three-person field party	\$165	\$1320
Registered Land Surveyor	\$83	\$664
Per diem	Use current federal per diem rate	
Transportation	\$.50/ mile	
Motel, camp expenses	Use current federal CONUS rates	

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

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

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

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Traverse: three-person crew. The production for traverse is dependent upon the precision of survey and number of points of intersection (PI's) per mile. This cost estimate is broken down according to the precision desired. It is, therefore, mandatory for the estimator to know the precision required before making the estimate. The chaining difficulty is constant with the number of PI's per mile on which this cost guide will be based. For average conditions consider a production rate of a half mile per day of completed work.

Survey Accuracy Standard

(Refer to FSH 7709.56, pg 3.9--2 for standards.)

	Precision		
	High (A,B)	Medium (C,D)	Low (E, Other)
PI's per mile	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		

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

<u>Accuracy Standard</u>	<u>Miles per day</u>
High (A,B)	0.5
Medium (C,D)	0.7
Low (E, Other)	1.0

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

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

Supervision: Allow 1 day per week of survey crew time for supervisory engineer @\$650 per day.

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

Office Work: Checking Notes-office work. All notes need to be office checked for completeness. Traverse and level notes need office work in recording and computation for angles and elevation. There is no per diem allowance for this work. Allow 1 to 2 hours per mile for one person at a rate of \$45 per hour.

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

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Road Design. (Includes classification, plan & profile, cross sections, and plan-in-hand reviews)
 Ranges from \$2,500 to 4,000 per mile for new construction.

Corner Search, Monumenting, and Boundary Marking & Posting.

Corner search costs are highly variable, depending on terrain, access, and difficulty of finding evidence. Monumentation costs can be estimated at \$150 to \$175 per corner. Marking and posting boundary lines can be estimated at \$5,000 to \$7,500 per mile. Additional allowance should be made for areas in rugged terrain, poor access, and heavy ground cover.

Other Preliminary Surveys.

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

Construction Staking and Survey Staking.

Average base cost:

Transect L-line:	\$1,600/ mi.
Offset L-line-high order:	\$1,400/ mi.
Offset L-line-low order:	\$1,300/ mi.
Finish grade:	\$2,000/ mi.

Add \$100.00 per culvert for culvert staking on reconstruction roads. Average base prices should be multiplied by the following factors to determine cost estimate. (Average project -- assume camp is within five miles of project and access is at the beginning of each job and each job is two miles in length.)

Approximate Relationships of Precision Options

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

Additional factors to consider

- Method I - Computed – multiply by 1.5
- Method II - Slope staking one side - 1.0
- Slope staking both sides – multiply by 1.15 to 1.3

- Side slopes - 0-30% - multiply by 0.9
- 50% and over – multiply by 1.1
- Brush density - Light – multiply by 0.9
- Heavy brush – multiply by 1.2

Project Requirements

SECTION 153 CONTRACTOR QUALITY CONTROL

These costs are to be included as subsidiary to the respective pay items.

DO NOT HAVE QUALITY CONTROL ASA SEPARATE PAY ITEM!

SECTION 154 CONTRACTOR SAMPLING AND TESTING (Contract Item)

There are four aspects of contractor sampling and testing:

- Certificates of compliance
- Field and laboratory sampling and testing
- Field measurements
- Records of sampling, testing, and measuring

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

- Approximately \$30/ day while the above-noted work is in progress.
- Approximately \$20/ day while the above-noted work is not in progress but work requiring contractor quantity measurements is in progress.

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

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

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

Overall costs for contractor sampling and testing, not including costs for individual tests, should range from \$500/ week for relatively simple projects to \$2,000/ week for more complex projects if only one technician is required. Add up to \$1,000/ week for each additional technician required.

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

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

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

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PROJECT FIELD SAMPLING AND TESTING

Asst. Project Engineer	\$95/ hr. (Assume 1 visit per month or \$190/ wk)
Sr. Eng. Technician	\$60/ hr. (Assume 2 visits per month or \$240/ wk for complex projects 1 visit per month or \$120/ wk for standard projects)
Eng. Technician	\$52/ hr. (Required daily for extensive sampling and testing, \$416/ day or \$2080/ wk for other projects, 3 days/ wk or \$1248/ wk)
Mileage	\$0.50/ mi.
Per diem	Approximately \$80/ day
Vehicle	\$100/ wk. + \$0.50/ mi
Mobile lab	\$500/ wk.
Tests (in laboratory)	
Mechanical analysis	\$70
Sieve analysis	\$100
Atterberg limits	\$100
Moisture/ density	\$150
R-Value/ CBR	\$450
Tests (in field)	
Inplace density	\$60
Sieve analysis	\$95
Moisture/ density	\$130
LAR	\$175
Concrete	
Mix design	\$1000
Compression test	\$15
Field test (including air, slump, cast and test 3 cylinders)	\$115
Asphalt	
Mix design	\$2000
Extraction	\$200
Gradation	\$100
Field Density/ Coring	\$70/ hr
Bulk Specific Gravity of core	\$50 each

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SECTION 156 - PUBLIC TRAFFIC

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

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

- a. When CIM is required to support a specific construction activity, payment and the cost estimate should be subsidiary to that item. Hauling of aggregate or borrow are examples of this. Maintenance associated with transport of right-of-way timber will be included in construction cost only for capital investment projects and only when timber becomes property of the contractor.
- b. If the CIM is required to support general construction access and traffic, CIM can be a subsidiary item to mobilization.
- c. If the amount of CIM is uncertain or likely to be variable, it may be advisable to estimate and make payment based on actual quantities under Section 622, Rental Equipment.

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

SECTION 157 - SOIL EROSION CONTROL

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

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

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

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

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

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

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

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

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

Suggest Parent Specification	Description of Work	Pay Unit	Estimated Cost	Percent Labor
157	<u>Temp Seeding & Fertilizing</u> Seed @40 lb/ acre, seed & fertilizer in one application Fertilizer @200 lb/ acre	Acre	\$300-\$600	20-70%
	<u>Dry Mulching (Straw or Hay)</u> Seed @40 lb/ acre Fertilizer @200 lb/ acre Straw or Hay @2 tons/ acre	Acre	\$600-\$1000	20-70%
	<u>Hydromulching (Wood Cellulose)</u> Seed @40 lb/ acre Fertilizer @200 lb/ acre J-TACK H-S @120-160 lb/ acre Wood Cellulose Fiber @150-300 lb/ acre Hay or Straw @2 tons/ acre Water as Necessary	Acre	\$2000-\$3500	20-50%
	<u>Temporary Netting</u> Should price using specific Material / Labor, etc	S.Y.	\$4-\$7	40-90%
	<u>Straw/ Hay Bales</u> (Weed free required) Bales placed by hand below CMP's prior to installation at live water; also used below outlet of cross-drains in highly erosive soil areas and in ditches.	Each	\$15-\$30	60-90%
	<u>Gravel Blanket Sheathing</u>	C.Y.	Estimate by Materials, Time & Equipment	
	<u>Silt Fence</u> Used 8' long Steel Posts @6' centers with 47" Hog Wire, Geotextile Fabric.	L.F.	\$4-\$12	30-60%

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157 or 201	<u>Brush Barrier</u> Method 12 In R-1 Cost Guide This work consists of placing brush on the fill slope to reduce sediment erosion.	L.F.	Estimate using CostGuide, Section 201	
	<u>Sediment Basin</u> Scoop native material from stream bed below live water prior to installation of new CMP. Place brush and straw bales on down-stream end of sediment basin. Can also place bales w/ brush to impede sediment flow. Use Time & Equip, estimate 15-30 min. w/ Cat 225	Each	Estimate by Materials, Time & Equipment	
	<u>Berm</u> Earth Berm	L.F.	\$.10-\$.15	30%
	<u>Dam</u>	Each	Estimate by Materials, Time & Equipment	
	<u>Temporary Water Bars</u> Constructed very shallow upgrade, but near CMPs and also midway between CMPs. Should be constructed just prior to compaction. Aggregate may be placed over temp waterbars, w/ o removal. Temp waterbars will not provide adequate protection when installed with soil in overly saturated state. Not intended for permanent use. Equipment - Cat 140 w/ operator, rate of production is 15-25 bars/ hr. Estimate construction just prior to compaction, no additional allowance made for compaction.	Each	Estimate by Materials, Time & Equipment	
204	<u>Permanent Water Bars</u> Constructed to design depth and location. Equipment - Cat D8K w/ operator rate of production is 3-4 bars/ hour	Each	Estimate by Materials, Time & Equipment	
	<u>Construction Dips</u> Equipment - D8K w/ operator and/ or Grader Cat 140 w/ operator	Each	Estimate by Materials, Time & Equipment	

Project Requirements

SECTION 160 - DEVELOP WATER SUPPLY AND WATERING (Labor 40-70 percent)

Estimated Quantity

For embankment, 5-10 gal/ CY

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

Total Cost

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

Estimating development of water source

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

Haul Costs (Includes truck and driver time)

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

The figures for ton-mile give the cost for 0.25 M-gallon.

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.

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End of Project Requirements