

# **DIVISION 100 GENERAL REQUIREMENTS**

## Conversion Tables of Weights and Measures

### Linear Measure

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

### Square Measure

1 square inch		= 6.452 square centimeters
144 square inches	= 1 square foot	= 929 square centimeters
9 square feet	= 1 square yard	= 0.8361 square meter
30 1/4 square yards	= 1 square rod = square pole = square perch	= 25.29 square meters
160 square rods 4,840 sq yards 43,560 sq ft	= 1 acre	= 0.4047 hectare
640 acres	= 1 square mile	= 259 hectares = 2.59 sq kilometers

### Cubic Measure

1 cubic inch		= 16,387 cubic centimeters
1,728 cubic inches	= 1 cubic foot	= 0.0283 cubic meter
27 cubic feet	= 1 cubic yard	= 0.7646 cubic meter
16 cubic feet	= 1 cord foot	
8 cord feet	= 1 cord	= 3.625 cubic meters

### Dry Measure

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

1 British dry quart	= 1.032 U.S. dry quarts
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### Liquid Measure

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

The British imperial gallon (4 imperial quarts) = 277.42 cubic inches = 4.546 liters.

The barrel in Great Britain equals 36 imperial gallons, in the United States, usually 31 1/2 gallons.

**Avoirdupois Weight**

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

The grain is equal to 0.0648 gram

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

**THE METRIC SYSTEM****Linear Measure**

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

**Square Measure**

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

**Land Measure**

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

**Volume Measure**

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

**Weights**

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

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## General Information and Instructions

**Revisions and Updates.** A review of the Cost Guide is conducted annually. Adjustments will be made if necessary. Revisions to the Cost Guide will be published in February.

**Specifications and Section Numbers.** The Cost Guide has been written using FP-03 (Standard Specifications for Construction of Roads and Bridges on federal Highway Projects) and FSSS (Forest Service Supplemental Specifications) as work item descriptions. The Specifications are referred to by Section Numbers. Supplemental Specifications are referred to by Forest Service Supplemental Specifications (FSSS). The FSSS's replace or modify the parent specification.

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

- **Supervision.** On very small jobs this may be provided by an operator/supervisor at essentially no additional cost.
- **Taxes** on purchase of material.
- **Bonding** cost (may be included in Section 151).
- **"Standby time"** for equipment and operators that are part of a "spread" performing a segment of work, but who are not working at full capacity all the time, averages 2 to 2 1/2 of the total contract cost (do not include bonding on timber sales). For example, during placement of aggregate, a grader, roller and water truck are needed. The grader and roller may be operating full time; the water truck only part time. The estimate should include standby time for the water truck to compensate for having it available on the job during the entire time of placing aggregate.
- **Support Equipment** - fuel trucks, pickups, crew transportation, etc.
- **Permits.**

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

**Unit Costs.** To ensure compatibility with the Spreadsheet for Preparation and Administration of Road Contracts (SPARCS), unit costs must be at least rounded to the nearest whole cent (\$0.01); however, the estimator should attempt to round off the unit price to the nearest significant figure. For example, clearing costs generally should be rounded to the nearest \$10 or \$25 per acre, excavation costs should be rounded to the nearest \$.01 per cy, and CMP costs are rounded to \$.50/LF. Quantities should never be carried out further than the nearest one-hundredth (0.01), and generally no further than the nearest one-tenth (0.1), depending on accuracy of measurements and cost or value of the item.

**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 6 percent. All unit prices shown in the Guide include this allowance, including the equipment rates (Table 622). Payroll overhead costs of 10 percent are used in all rates in addition to the 6 percent profit and risk factor.

**Time Estimates.** In accordance with Section 52.212-3 of the Federal Acquisition Regulations (FAR's), contract time for public works contracts must be calculated based on a continuous run of contract time. The contract time must include an estimate of the winter shutdown time. If the midpoint of construction is computed, it should be based on the midpoint of work or the midpoint of estimated cash flow, not the midpoint of contract time.

**Public Works & Timber Sale Estimates.** All engineer's estimates for road construction, with the exception of allowances for quality control, are to be prepared as if construction is to be accomplished by a public works contract. Quality control policy for timber sales may change after Guide is published.

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

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

**Contractor Quality Control (QC) and Quantity Measurement.** Section 153 is for use on Capital Investment and 14i (turnback) contracts; costs are to be subsidiary to their associated pay items. Do not have a separate pay item for quality control. Please note that R-1's FSSS for Section 160 outlines the frequency of sampling and testing and are mandatory for public works road contracts. R-1 FSSS 105 is required for timber sales which have aggregate surfacing, and does have some measurement and sampling requirements. Estimating procedures and unit costs for contractor QC are outlined in Section 153 of this Guide. Estimator is reminded to stay current with policy regarding timber sale QC requirements.

**Midpoint of Construction.** The midpoint for construction for unit costs shown in the bid summary in this Guide is estimated to be April. Until further notice, no adjustments to unit costs for inflation will be calculated.

**Use of Costs Other Than Shown in the Cost Guide.** When local experience indicates unit costs are different than those shown in this Guide, local costs should be considered. Cost deviations from this Guide shall be documented and included in the project file.

**Small Quantity Adjustments.** Estimates should consider all roads that are included in a contract package that are within a five mile radius as one project for the purposes of small quantity adjustments. Therefore, small quantity factors should not be applied to individual road costs when the individual

roads are part of a larger group of road projects in the same vicinity and part of the same contract. On the other hand, where small quantities are involved, estimators should increase allowances due to the inefficiencies generally encountered in small projects. Of particular concern, are projects where small quantities of aggregate are involved. Mobilization of equipment may outweigh the direct costs of the aggregate, short road construction projects also have a relatively high mobilization cost for transport of dozers and excavators.

**Signs.** On public works contracts, the contract should require the contractor to furnish and install all signs in accordance with the project sign plan. For 14i (turnback) and timber sale contracts, Regional policy (FSM 7720 supplement) may be revised which will require the furnishing and installation of regulatory and warning signs by the timber purchaser. However, at the date of publishing, existing policy has not been revised. Current policy is that signs for closure devices (gates, barricades, etc.) on timber sale projects (including 14i contracts) are considered as a part of the closure device and should be furnished and installed by the purchaser (or 14i contractor), this includes advance warning signs for such closures. Route markers are part of the road work and are furnished by the purchaser (mile markers are also required road work signs). Other necessary regulatory/warning signs are to be furnished by the Government and installed by the purchaser (14i contractor).

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

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

**North Dakota / South Dakota / Washington.** Costs estimates for road construction in these States should be adjusted by local equipment and material costs, applicable Davis-Bacon wage rates, and local labor rates. The costs in this Guide are oriented to activity in Idaho and Montana.

**FP-03 Specifications.** All cost in this guide are associated with the FP-03 and FSSS specifications. Specifications may change and users of this guide should verify that the costs are associated with the correct type of work.

**Storm Water Permitting.** EPA regulations require permits for road construction activity with more than 5 acres disturbance except in Montana where the disturbance is 1 acre, or rock pits and quarries. Timber sale road construction is exempt from the regulations, but rock pits or quarries for timber sale roads must be permitted.

Permit regulating agency by State:

- Idaho: EPA
- Montana: Water Protection Bureau
- South Dakota: Department of Environmental and Natural Resources
- North Dakota: Division of Water Supply and Pollution Control.

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

**Montana Stream Protection Act (SPA 124) and 318 Authorization Permits.** SPA 124 permits issued by the Montana Department of Fish, Wildlife and Parks are required for any project including the construction of new facilities or the modification, operation, and maintenance of an existing facility that may affect the natural existing shape and form of any stream or its banks or tributaries. There is a 60 day review period. There is no application fee.

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

**Internet.** The cost guide can be found on the Forest Service Northern Region internet by navigating through *Working Together, Contracting, Cost Estimating Guide for Road Construction*. If you do not have access to a computer and the internet, you can request a copy from U. S. Forest Service, Region One, Engineering.

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

*End of Division 100 General Rquirements*

# **ENGINEER'S ESTIMATE**

**ENGINEER'S ESTIMATE**

The preliminary estimated unit costs may need to be adjusted. Determine the area and/or zone and adjust the unit costs per instructions of this section.

**DETERMINATION OF WAGE RATE AREA/ZONE**

**IDAHO**

Area 1. The portion of Region 1 that lies in Idaho with the exception of that portion of Idaho county that lies south of the 46th parallel is in Area 1

*Note: Area 1 has been expanded to two zones which is being defined by the distance from the Post Offices in Spokane, Pasco, Washington, and Lewiston, Idaho.*

- Zone 1: Within 45 radius miles from the main Post Office
- Zone 2: Outside 45 radius miles from the main Post Office

Area 2. The portion of Region 1 that lies in Idaho County and south of the 46th parallel is in Zone 2 of Area 2. This includes most of the Nez Perce National Forest. Therefore all reference in this guide to Area 2 is for Zone 2 of that Area. (Zone 1 lies in the southern part of Area 2 and is a 60 mile (97 kilometers) wide strip following I-84, I-86, and part of I-15.)

- Zone 2: Idaho County south of the 46th parallel

**MONTANA**

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

Billings	Glasgow	Helena	Miles City
Bozeman	Glendive	Kalispell	Missoula
Butte	Great Falls	Lewistown	Sidney
Dillon	Havre		

The zones are defined as:

- Zone 1: 0-30 miles
- Zone 2: 30-60 miles
- Zone 3: over 60 miles

**NORTH DAKOTA / SOUTH DAKOTA / WASHINGTON**

Adjust the preliminary unit costs by applicable Davis-Bacon wage Area and/or Zone differential. Contact the Regional Office for necessary data.

**ADJUSTMENT FACTORS FOR THE UNIT COSTS**

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

**Adjustment Factor for Public Works Davis-Bacon Zones**

LABOR %	IDAHO AREA 1 ZONE 1	IDAHO AREA 1 ZONE 2	IDAHO AREA 2 ZONE 2	MONTANA ZONE 1	MONTANA ZONE 2	MONTANA ZONE 3
5	1.00	1.00	1.00	0.99	1.00	1.00
10	0.99	1.00	1.00	0.99	1.00	1.00
15	0.99	1.00	1.00	0.98	0.99	1.00
20	0.99	1.00	1.00	0.98	0.99	1.00
25	0.99	1.00	1.00	0.97	0.99	1.00
30	0.98	1.00	1.00	0.96	0.99	1.00
35	0.98	1.00	1.00	0.96	0.98	1.00
40	0.98	1.00	1.00	0.95	0.98	1.00
45	0.98	1.00	1.01	0.95	0.98	1.00
50	0.97	1.00	1.01	0.94	0.98	1.00
55	0.97	1.00	1.01	0.93	0.98	1.00
60	0.97	1.00	1.01	0.93	0.97	1.00
65	0.96	1.00	1.01	0.92	0.97	1.00
70	0.96	1.00	1.01	0.92	0.97	1.00
75	0.96	1.00	1.01	0.91	0.97	1.00
80	0.96	1.00	1.01	0.90	0.96	1.00
85	0.95	1.00	1.01	0.90	0.96	1.00
90	0.95	1.00	1.01	0.89	0.96	1.00
95	0.95	1.00	1.01	0.89	0.96	1.00
100	0.94	1.00	1.01	0.88	0.95	1.00

**Examples**

Example No. 1:

Idaho, Area 1 (Zone 2)  
 18" culvert (new construction)  
 Percent labor = 25%  
 Cost Guide unit cost = \$22.00/lf  
 Area 1 unit cost = \$22.00 x 1.00 = \$22.00/lf no adjustment.

Example No. 2:

Idaho, Area 1 (Zone 1)  
 18" culvert  
 Percent Labor = 35%  
 Cost Guide unit cost = \$22.00/lf  
 Area 2 unit cost = \$22.00 x 0.98 = \$21.56/lf rounded.

Example No. 3:

Montana, Zone 3  
 18" culvert  
 Percent Labor = 25%  
 Cost Guide unit cost = \$22.00/lf  
 Zone 3 unit cost = \$22.00 x 1.00 = \$22.00/lf rounded

*End of Engineer's Estimate*

# **DAVIS-BACON/PURCHASER WAGE RATE ADJUSTMENTS**

### Davis-Bacon/Purchaser Wage Rate Adjustments

All projects must first be estimated as if being built by public works contracts with respect to Davis-Bacon wage rates. For Timber Sale Contracts, the engineer's estimate must then be adjusted by the difference between Davis-Bacon and local wage rates to determine the Specified Road Cost (Specified Road Construction Cost plus augmentation if any).

The following labor percentage ranges are typical and include equipment operator, 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.

**LABOR PERCENTAGE RANGES**

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

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

## Davis-Bacon/Purchaser Wage Rate Adjustments

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

- Determine the Davis Bacon wage rate area and/or zone. For instructions, see the previous section of this guide, Engineer's Estimate.
- Determine labor percentage for applicable item in the body of this Guide or from the LABOR PERCENTAGE RANGES table on the previous page.
- Select the appropriate labor factor from the ADJUSTMENT FACTOR FOR WAGE DIFFERENTIALS chart.
- Determine Specified Road Construction Cost for applicable item **by dividing** the public works cost by the labor factor determined from the ADJUSTMENT FACTOR FOR WAGE DIFFERENTIALS chart.

### Adjustment Factor for Wage Differentials

LABOR %	IDAHO AREA 1 ZONE 1	IDAHO AREA 1 ZONE 2	IDAHO AREA 2 ZONE 2	MONTANA ZONE 1	MONTANA ZONE 2	MONTANA ZONE 3
5	1.01	1.01	1.01	1.01	1.02	1.02
10	1.02	1.02	1.03	1.03	1.03	1.03
15	1.03	1.04	1.04	1.04	1.05	1.05
20	1.04	1.05	1.05	1.05	1.06	1.07
25	1.05	1.06	1.07	1.07	1.08	1.09
30	1.06	1.08	1.08	1.08	1.10	1.11
35	1.07	1.09	1.10	1.09	1.12	1.13
40	1.08	1.11	1.11	1.11	1.14	1.16
45	1.10	1.12	1.13	1.12	1.16	1.18
50	1.11	1.14	1.14	1.14	1.18	1.20
55	1.12	1.15	1.16	1.16	1.20	1.23
60	1.13	1.17	1.18	1.17	1.22	1.25
65	1.15	1.18	1.19	1.19	1.25	1.28
70	1.16	1.20	1.21	1.21	1.27	1.31
75	1.17	1.22	1.23	1.22	1.30	1.34
80	1.19	1.24	1.25	1.24	1.32	1.37
85	1.20	1.26	1.27	1.26	1.35	1.40
90	1.21	1.28	1.29	1.28	1.38	1.43
95	1.23	1.30	1.31	1.30	1.41	1.47
100	1.24	1.32	1.33	1.32	1.44	1.51

Example:

Public Works Excavation cost = \$1.75/cy  
 Project Location: Idaho, Area 1 (Zone 1)  
 Excavation: labor percentage = 25 percent  
                   labor factor = 1.05  
 Specified road construction cost = \$1.75/1.05 = 1.67/cy

## Davis-Bacon/Purchaser Wage Rate Adjustments

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*End of Davis-Bacon/Purchaser Wage Rate Adjustment*

# **TIME ESTIMATES & CALCULATION OF MIDPOINT OF CONSTRUCTION**

# Time Estimates and Calculation of Midpoint of Construction

## Time Estimates and Calculation of Midpoint of Construction

Even though there is no adjustment factor for inflation in this Cost Guide, care must be exercised when determining time estimates. The final time estimate should not be made until all contract clauses are known, including applicable C clauses for timber sale contracts. Be sure to consider operating season limitations. Project access and sequencing must also be considered.

Except in unusual circumstances, the time estimate shall not exceed two (2) full construction seasons. This may require increasing the size of the crew and the amount of equipment used in the estimate. In addition, this may require the adjustment of some cost items and contract clauses. Time estimates in excess of two full construction seasons shall be justified, documented, and approved by the Forest Engineer.

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

Due to the requirements of the Federal Acquisition Regulations (FAR's), it is essential that the midpoint be computed based on the midpoint of work or estimated cash flow, not the midpoint of contract time. FAR 52.212-3 requires that contract time be established to include estimated winter shutdowns. Contract time will continue to count through the winter season.

The remainder of this section contains two examples of determining the midpoint of construction followed by two forms. The first form may be used in calculating the midpoint of construction, and the second for use in determining the number of contract days.

### ***Example 1: Analyzing Incremental Construction Periods***

(Note: Example and must be modified using the correct dates.)

Advertise	May 1, 2002	Work Season	May 15 - Nov 15
Open Bids	June 2, 2002	Total Work Days	200
Contract Award	June 15, 2002	Completion Date	July 15, 2003
Start Work	July 1, 2002	Project Cost	\$300,000

	Date	Calendar Day	Project Day
Start Work 2002 Season:	Jul 1	182	1
Suspend Work 2002 Season by:	Nov 16	320	138
Resume Work 2003 Season:	May 15	135	318
Complete Work 2003 Season before:	Jul 16	197	381

2002 Season	= 138 - 1	= 137 Work Days
Shutdown	= 318 - 138	= 180 Days
2003 Season	= 381 - 318	= 63 Work Days

Total Work Days = 2002 Season (137 days) + 2003 Season (63 days)	= 200 Days
Contract Days = Work Days + Winter Shutdown = 200 + 180	= 380 Days

## Time Estimates and Calculation of Midpoint of Construction

*Incremental Construction Periods:*

2002 Construction Increment:  $2002 \text{ Work Days} / \text{Total Work Days} = 137/200 = 0.685$

2002 Value = Project Cost x 2002 Increment =  $\$300,000 \times 0.685 = \$205,500$

2003 Construction Increment:  $2003 \text{ Work Days} / \text{Total Work Days} = 63/200 = 0.315$

2003 Value = Project Cost x 2003 Increment =  $\$300,000 \times 0.315 = \$94,500$

*Midpoint of Construction:*

2002 Midpoint:  $2002 \text{ Work Days} / 2 = 137 / 2 = 68.5 \text{ Project Days}$

2003 Midpoint:  $2002 \text{ Work Days} + \text{Winter Shutdown} + 2003 \text{ Work Days}/2 =$   
 $138 + 180 + 63/2 = 349.5 \text{ Days}$

Weighted Midpoint =  $[(2002 \text{ Value} \times 2003 \text{ Midpoint}) + (2003 \text{ Value} \times 2002 \text{ Midpoint})] / \text{Project Cost}$   
 $= [(205,500 \times 68.5) + (94,500 \times 349.5)] / 300,000 = 157 \text{ Days}$

Midpoint of Construction = 157 Project Days = December 4, 2002

**Example 2: Analyzing Construction Items**

(Same project schedule as used for Example 1):

(Note: Example and must be modified using the correct dates.)

	← Start Work	→	← Completed by	→				
Item	Date	Calender Day	Project Day	Date	Calender Day	Project Day	Midpoint	Cost
Clr&Grub	7/01/2002	182	1	10/01/2002	274	93	46	\$75,000
Exc &CMPs	8/01/2002	213	32	6/15/2003	166	350		\$125,000
Season 1	8/01/2002	213	32	11/16/2002	320	139	85.5	\$96,900
Season 2	5/15/2003	135	319	6/15/2003	166	350	334.5	\$28,100
Aggr&Surf	5/15/2003	135	319	7/01/2003	182	366	342.5	\$90,000
Seed&Mulch	7/01/2003	182	366	7/16/2003	197	381	373.5	\$10,000

Clearing Midpoint:  $\text{Clearing Work Days} / 2 = (93-1) / 2 = 46 \text{ Project Days}$

Excavation & Culverts Midpoint: This item falls during portions of two seasons. There are 107 construction days available in 2002 and 31 days available in 2003 for a total of 138 days.

Value of Work in 2002	$107 \text{ days} / 138 \text{ days} \times \$125,000$	= \$96,900
Value of Work in 2003	$31 \text{ days} / 138 \text{ days} \times \$125,000$	= \$28,100
Midpoint 2002	$32 + (139 - 32) / 2$	= Proj Day 85.5
Midpoint 2003	$319 + (350 - 319) / 2$	= Proj Day 334.5

Excavation & Culvert Weighted Midpoint =  $[(96,900 \times 85.5) + (28,100 \times 334.5)] / 125,000 = 141 \text{ Days}$

Aggregate Surfacing Midpoint =  $\text{Item starting day} + \text{item days}/2 = 319 + (366 - 319)/2 = 342.5 \text{ Days}$

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

Weighted Midpoint =  $[(46 \times 75,000) + (85.5 \times 96,900) + (334.5 \times 28,100) + (342.5 \times 90,000) + (373.5 \times 10,000)] / 300,000 = 186 \text{ Days}$

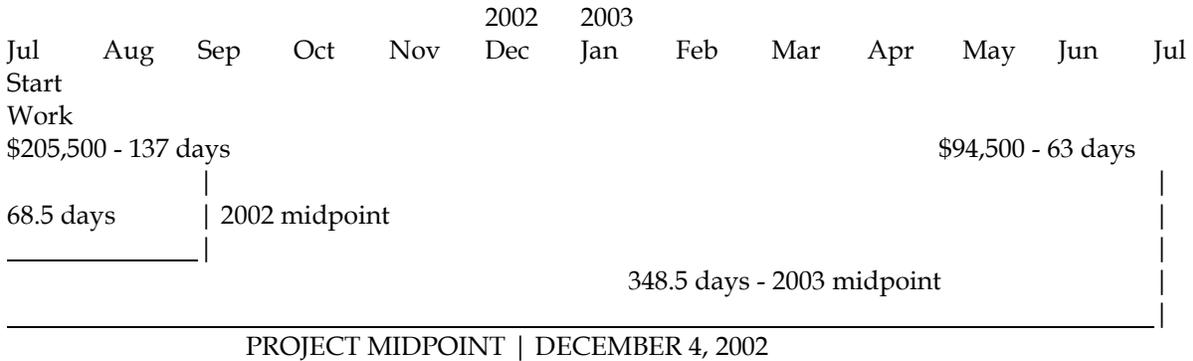
Midpoint of Construction = 186 Project Days or January 2, 2003

# Time Estimates and Calculation of Midpoint of Construction

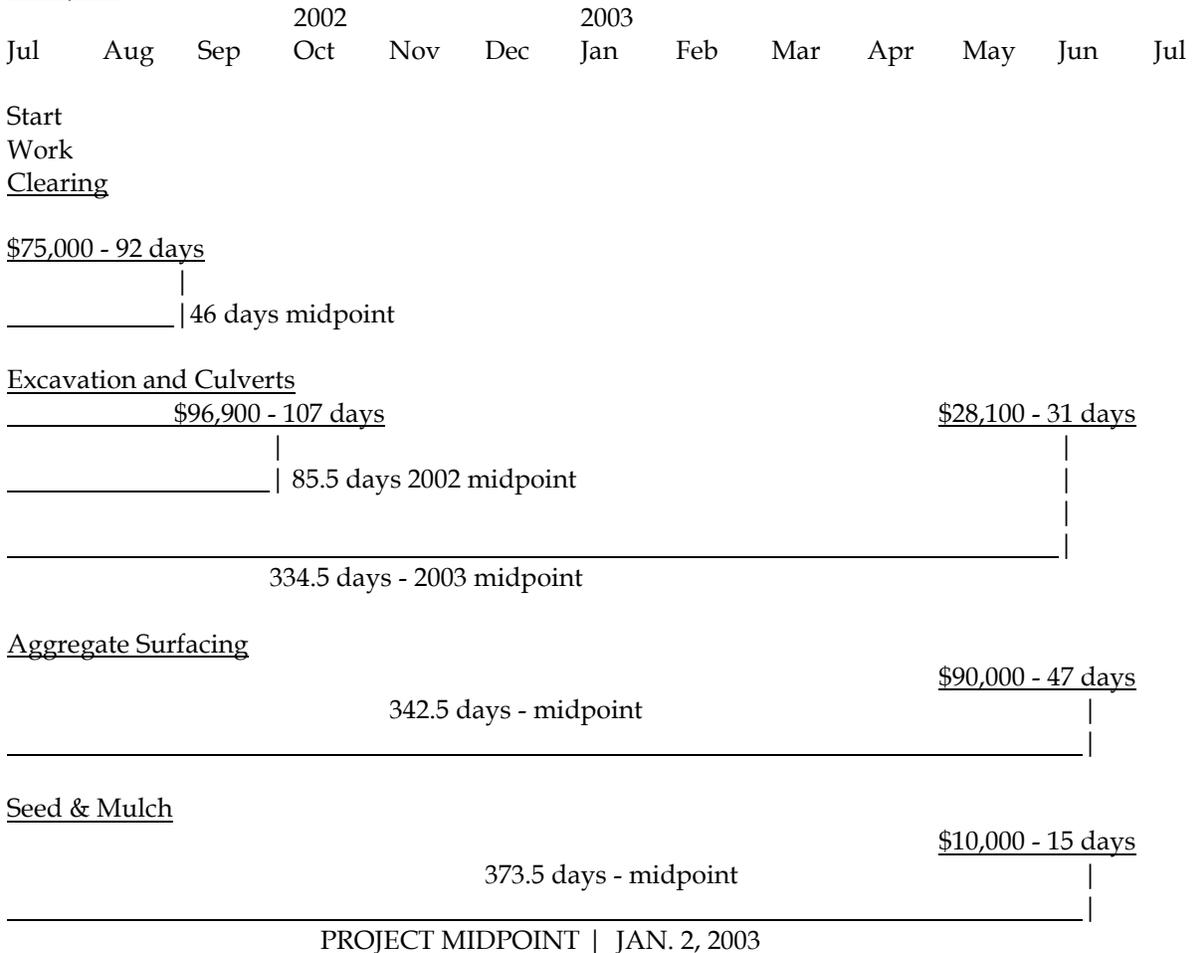
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*Note: This is an example, modify using the correct dates for your project.*

## Example Graphical Display of Midpoint Calculations



## Example 2



## Time Estimates and Calculation of Midpoint of Construction

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### Worksheet for Incremental Construction Periods

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

# Time Estimates and Calculation of Midpoint of Construction

## Time Estimating and Scheduling Worksheet

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

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

\* The following time requirements may vary by local policy, 120 days is the maximum time allowed without approval of the Regional Forester.

10 days to submit road package to Administrative Services.

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

15 days to public prior to solicitation.

30 days advertising period.

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

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80 days Total

*End of Time Estimates and Calculation of Midpoint Construction*