Forest Service Handbook
National Headquarters - Washington Office
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Forest Service Handbook 7709.56 – Road Preconstruction Handbook
Chapter 70 - Plans, Specifications, and Estimates

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Superseded Directive: 7709.56_7, Amendment 1, May 1987

Approved by: James M. Pena, Associate Deputy Chief, NFS

Date approved: July 7, 2011

Responsible Staff:

Explanation of changes: Following is an explanation of the changes throughout the directive by section.

70: Changes chapter title from "Drawings, Specifications, and Estimates" to Plans, Specifications, and Estimates."

Updates coding from 1-digit to recommended 2-digit coding. Reorganizes and makes minor technical and editorial changes and adds specific direction for timber sales throughout the chapter. Removes obsolete reference to Purchaser Credit (sec. 7.54).

70.5: Establishes code and caption for "Definitions" and sets forth definitions for terms used throughout directive.

71: Changes caption from "Drawings" to "Plans."

72: Revises direction to use the most current version of Federal Highway Administration's Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects (FP).

72.1: Changes caption from "Preparation and Quality of Specifications" to "Preparation and Content of Specifications." Revises direction to use performance based specifications.

72.2: Changes caption from “Use and Selection of Standard Specifications” to “Use of Specifications.” Recodes direction on Schedule of Items and Specification List to section 72.3. Removes obsolete direction on methods of assembling specifications.

72.3: Changes caption from “Coordination of Specifications and Drawings” to “Listing of Specifications.” Recodes direction on coordination of specifications and plans to section 72.4.

72.4: Establishes code and caption “Coordination of Specification and Plans” and recodes direction previously set out in 7.23 to this section.

73: Changes caption from “Road Cost Estimates” to “Pay Items” and sets forth new direction for pay items. Recodes direction previously set out in this section to section 74.

73.1: Establishes code, caption, and sets forth direction for “Determination and Use of Pay Items.”

74: Changes caption from “Preliminary Road Cost Estimates” to “Cost Estimates.” Recodes direction previously set out in 7.3 to this section.

74.1: Establishes caption “Preliminary Cost Estimates” and recodes sections 7.4 and 74.1 and combines sections 7.42 through 7.45 into this section. Removes obsolete quantity estimating exhibits.

74.2: Establishes caption “Engineer’s Estimate (final Cost) and recodes to this section 7.5 through 7.52b. Adds exhibit 01 Pay Item Cost Estimating Flowchart.

74.3: Changes caption from “Range of Reliability” to “Time Estimates and Cost Projections.” Recodes direction previously set out in 7.53 to this section. Removes obsolete direction on midpoint construction calculations.

74.4: Changes caption from “Displaying Preliminary Cost Estimates” to “Documentation.” Recodes direction previously set out in 7.56 to this section.

74.5: Changes caption from “Aids to Preliminary Cost Estimating” to “Qualifications of Estimators.” Recodes direction previously set out in 7.57 to this section.

74.6: Establishes code and recodes to this section caption and direction previously set out in 7.58.

74.7: Establishes code and recodes to this section caption and direction previously set out in 7.59.

Table of Contents

This chapter provides guidance in the development of project plans, specifications, and cost estimates. It is essential that plans, specifications, and estimates be fully integrated. This integration is reached through an independent review and cross-check of the drawings, specifications, and estimates by an individual who is thoroughly familiar with the project and contract documents.

70.5 - Definitions

Contract package. Contract documents (plans, specifications, pay items, and estimate of cost) for performing the work to construct a project.

Drawings. Typical layouts or details drawn to describe location, dimensions, and or tolerances to construct a specific element of a project.

Engineer's estimate. Responsible engineer's estimate of cost to perform the work required for the project. Estimates serve as probable construction amounts against which bidders' proposals are evaluated. Estimates also advise program management decisions regarding programming funds for construction, related engineering, utility work, and so forth. Estimates are subject to review and approval under FSM 7721.04c.

Forest Service Supplemental Specifications (FSSS). Provisions that modify the Federal Highway Administration's "Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects" (FP) for use in Forest Service contracts.

Local Logging Industry Wage Rates (Woods Rates). At a minimum, include the basic hourly wage rate; fringe benefits (pension, health and welfare, apprentice training, and vacation); payroll taxes (unemployment insurance tax, worker's compensation tax, and social security tax); travel costs; and payroll overhead.

Method specification. A provision that requires work be done by prescribed methods to achieve a desired end result.

Plans. Graphic representation of the proposed work. Project plans consist of a title sheet, location maps, quantity sheet, drawings, and details necessary to define construction of a project. Project plans are a legal contract document. Requirements for review and approvals are outlined in FSM 7721.04c.

Pay item. A specific item of work for which a unit price is provided in the contract.

Performance-based specification. A provision that allows the contractor to select the methods and equipment to achieve a desired end result.

Public Works Wage Rates. As a minimum, are rates composed of the Davis-Bacon basic hourly wage rate; benefits such as pension, health and welfare, and apprenticeship training as published in "General Wage Determination Issued Under the Davis-Bacon and Related Acts," and the costs of payroll taxes and payroll overhead.

Standard drawings. Graphical representations of typical layouts and construction details for elements that are the same from project to project. They typically include title sheets, culverts and drainage features, cattleguards, gates, guardrails, fences, signs, and traffic control devices.

Standard specifications. Written requirements for performing work for construction of roads and bridges on Forest Service projects approved for general application and repetitive use.

Supplemental specifications. Provisions written to modify, supplement, replace, or delete standard specifications in whole or in part. These are included in the body of the contract as special contract requirements.

Tolerances. Tolerances are exceptions to specified measurements.

71 - Plans

Prepare plans for all construction projects whether constructed by public works contract, timber sale contract, land stewardship contract, force account, special use permit, cooperative agreement, or other methods. Plans for construction of roads through timber sale contracts and land stewardship contracts should be prepared to standards sufficient for construction of those roads by public works contract. Show references to designated material sources on the plans. Avoid references to timber sale contract provisions or terminology in the plans.

Plans provide the following:

1. A basis for cost estimates and bid proposals.

2. Sufficient details, when combined with the specifications, to construct the project as designed.

3. A record of the project.

Prepare plans with sufficient thoroughness and accuracy to clearly depict the project and to minimize changes during construction. Avoid unnecessary details. Include only details and notes that are necessary for cost estimating, bid preparation, and construction. Include details referenced by the specifications. Do not repeat or include specifications as notes in the plans.

Specific references to contract clauses or contract provisions should not be included in plans.

Drawings should contain details such as dimensions, quantities, location of feature to be constructed, and materials to be used.

Use consistent formats for drawings to depict construction elements that are not included in standard drawings. Examples include plan-profile sheets, line or bar diagrams, cross section sheets, and narrative descriptions.

71.1 - Standard Drawings

Regions and/or forests should develop standard drawings for features that are commonly constructed. Standard drawings establish consistency in construction of particular features and increase efficiency in contract preparation and administration. Use standard drawings whenever possible to expedite the contract package preparation, project review process, and approval of projects.

72 - Specifications

Specifications are the written requirements for performing work. Specifications must clearly describe the required work, materials, and expected results.

Provide clear references between the plans and specifications and provide all data and information necessary to complete the work. In case of discrepancies between plans and specifications, specifications take precedence over plans in both public works and timber sale contracts.

For construction of roads and bridges, use the most current version of the Federal Highway Administration's "Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects" (FP) and Forest Service Supplemental Specifications (FSSS). FSSS consist of national supplemental specifications, regional, and forest or project supplemental specifications. Supplemental specifications are included in the body of the contract. Regions and forests modify the FP by writing supplemental specifications. Supplemental specifications modify only the FP and are not used to modify other FSSS. Regional, forest, and project supplemental specifications should be written in the same format as the national supplemental specifications. If a project requires any modification of the national FSSS to meet project needs, replace the FSSS with a forest or project supplemental specification. The content of FSSS may be copied in whole or in part to develop appropriate supplemental specifications. The engineer delegated signature authority shall approve the use of project or forest supplemental specifications. FSSS modifies the FP.

72.1 - Preparation and Content of Specifications

1. Principles of Well-Written Specifications. Well-written specifications are fair, clear, complete, technically accurate, consistent, concise, and economically appropriate.

a. Fairness. Do not expect the contractor to assume the risks and responsibilities related to engineering oversights and omissions, ambiguities, or inconsistencies in the plans or specifications.

b. Clarity. Express specifications in unambiguous language using short sentences. Use words that represent their true dictionary or technical meaning. Terminology must be correct and not be subject to interpretations that contradict the intended meaning. Avoid flexible, legally unenforceable terms such as "as directed by the engineer," "to the satisfaction of the engineer," "where possible," and "as feasible." State requirements accurately and clearly.

c. Completeness. A complete specification gives all of the information necessary to estimate costs, construct, and administer a contract.

d. Correctness. Specifications must only address facts and use only data that is reliable and timely. Specifications must be legally and technically sound. Address only the technical requirements.

e. Consistency. Carefully coordinate each contract document with all others to avoid duplication, conflict, or omissions. Do not repeat information on the plans that is contained in the specifications. Use the same terminology on plans and in specifications. Use the same organization and format for all specifications.

f. Conciseness. Include only essential facts, words, and phrases. Use the shortest sentence that expresses the intended meaning.

g. Economy. Specifications significantly influence the cost of construction. Limit the intended work and the quality of material requirements to the minimum levels that will produce satisfactory results.

2. Performance Specifications Preferred. Whenever possible, use performance-based specifications, which describe the work in a manner making the contractor responsible for selecting methods, materials, and equipment to achieve a desired end result. This allows contractors more flexibility and often results in lower cost to the Government. It also reduces the risk to the Government and requires less administration of the project.

3. General Content. Contractors can bid a project at their most competitive price if the specifications clearly spell out the following:

a. The work to be done, the method of measurement, and the basis of payment.

b. The work to be done by prescribed methods (method specifications), and the work for which the contractor selects methods, materials, and equipment to achieve end results (performance-based specifications).

c. The risks the contractor is to assume.

d. The quantity and nature of work the contractor is to do without direct payment (incidental work).

e. The allowable construction tolerances.

72.2 - Use of Specifications

Include the most current version of the Federal Highway Administration's "Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects" (FP) by reference and include all applicable Forest Service Supplemental Specifications (FSSS).

The FP contains requirements that are not applicable to, or exceed standards for Forest Service projects. Supplemental specifications have been developed to incorporate Forest Service road standards, implement laws and policy, and to control costs. Therefore, many of the FP specifications must be modified for Forest Service projects. These modifications are made through Forest Service Supplemental Specifications (FSSS). FSSS may be developed for national, regional, forest, or project level use.

Each FSSS is unique and is assigned a unique number. The number is associated with the unique content in that particular specification. This ensures consistent application and use of that FSSS nationwide. Changing as little as a word or sentence requires a new supplemental specification with a new unique number. The number is determined by the FP section being modified, the authoring unit (Washington Office, regional office, or forest), and the date it was approved for use. Example: National Supplemental Specification: 101.01_nat_us_03-02-2004. This supplemental specification number modifies FP section 101.01, written as a national supplemental, approved March 2, 2004, and is written in U.S. Customary units of measurement.

1. National Forest Service Supplemental Specification (FSSS). National FSSS are supplemental specifications that are applicable to typical Forest Service projects and establish a common standard for road construction. They consist of supplemental specifications that are mandatory for ALL Forest Service contracts using the FP; some that are required when specific types of work are included in a contract, and others that are optional.

a. Mandatory FSSS. The FP was developed to construct projects under Department of Transportation Acquisition Regulations (TAR). Mandatory national FSSS modify Division 100 specifications in the FP for use in Forest Service contracts under Department of Agriculture Acquisition Regulations. These Division 100 FSSS must be included in ALL Forest Service contracts using Department of Agriculture Acquisition Regulations. Mandatory supplemental specifications are not to be modified by regions or forests. Do not include these Division 100 FSSS in contracts using timber sale contract authorities.

b. Required FSSS for specific work. Some FSSS are required only when specific work is required in the contract. For example, when including FP Section 201 Clearing and Grubbing in a Forest Service contract, modification of the parent specification through the required 201 FSSS is necessary to comply with laws regarding disposal of merchantable timber. Without modification, the FP gives the contractor all merchantable timber. The appropriate utilization and disposal of merchantable timber must be modified by supplemental specification to comply with laws governing the Forest Service. In contracts with no clearing and grubbing, the national 201 FSSS is not required.

c. Optional FSSS. The responsible engineer selects when and if to use these FSSS.

2. Regional. Regional supplemental specifications should only be developed to implement requirements specific to a region or to multiple forests in that region. For example, regional supplemental specifications may be used to implement vegetation

management requirements in a memorandum of understanding, to implement State-specific Clean Water Act requirements, or to implement a decision to establish standards or best management practices made by a regional forester using procedures for implementation of the National Environmental Protection Act (that is, environmental assessments/environmental impact statements (EA/EIS)).

3. Forest or project. Forest or project supplemental specifications should be developed only to implement requirements specific to a forest or unique to a project. These should be used only when national or regional supplemental specifications do not meet local needs.

Carefully read the parent FP and all available supplemental specifications to determine the need for modifications through additional FSSS. A new supplemental specification should only be created when existing FSSS do not meet the need.

Supplemental specifications modify only the FP (parent specification) and NOT other supplemental specifications. Replace existing FSSS only when they do not meet project needs. The content of parent or existing supplemental specifications may be copied in whole or in part to develop appropriate supplemental specifications. Changing as little as a word or sentence requires a new supplemental specification with a unique number and typically is a project supplemental specification.

The supplemental specifications used to modify the FP must not:

1. Replace or modify mandatory Division 100 FSSS.

2. Include pay items in supplemental specifications.

3. Duplicate, delete, or contradict requirements of the parent FP specification.

4. Duplicate, delete, or contradict national or regional requirements that are included in other FSSS.

5. Delete or contradict references and payments as specified in the parent FP specification.

In the FP, work is specified in one or more sections while payments may be made under requirements found in different sections. This is an important consideration when writing new supplemental specifications.

72.3 - Listing of Specifications

Include a Specification List to itemize applicable work and materials for projects. Prepare specification lists for timber sales by road segment. Lists include standard (parent) specifications, all supplemental specifications identified by pay item in the Schedule of Items, and the standard and supplemental specifications for which pay items have not been established. Do not include standard specifications that are referenced in the listed specifications.

72.4 - Coordination of Specifications and Plans

The specifications and plans must completely describe the requirements for constructing a satisfactory road.

Many specifications contain the statement "As shown on plans or in Supplemental Specifications." References should be made between the plans and specifications to adequately cover these requirements and provide data needed to complete the work.

Prepare plans for timber sale contracts that are usable in public works contracts. Avoid references to timber sale contract provisions or terminology on the plans that are not appropriate in a public works contract.

Specifications take precedence over plans in both public works and timber sale contracts.

73 - Pay Items

Pay items are the means by which contract items are measured and paid for. Pay items must clearly relate to the work and clearly define the unit of measure for which a price is established.

73.1 - Determination and Use of Pay Items

Determine quantities for pay items during the course of design. Include an estimated quantity for each proposed pay item consistent with standard and supplemental project specifications.

Select pay items from the most current Forest Service pay item list to address methods, measurement, and payment that are specific to Forest Service work. This list may be supplemented as needed for specific projects. Create new pay items in the same format as existing pay items.

74 - Cost Estimates

There are two basic types of cost estimates: preliminary and engineer's estimates. Preliminary estimates are developed to support planning, programming, and budgeting activities. Engineer's estimates are used for economic selection, bid verification, and contract negotiations. Estimates should be project specific and based on current estimating theory, policy, and procedures. Final cost estimates must be reviewed by a qualified individual as described in FSM 7721.04c.

74.1 - Preliminary Cost Estimates

1. Types and Uses of Preliminary Estimates. There are two general types of cost estimates used in preliminary road cost estimating: the office estimate and the field verified estimate.

    a. Office Estimate. Initial cost estimates are based primarily on office information such as land and resource management plans, aerial photographs, topographic maps, GIS data, and other available resource information. A brief field verification of critical areas identified in the office may be needed. In general, use office estimates

to support activities such as forest planning, resource management planning, area travel analysis, and long-range (5 years or longer) fiscal programming.

b. Field Verified Estimate. This type of estimate is based on all the information gathered in an office estimate plus more extensive field verification, including some rough field measurements. More detailed information concerning resources is gathered. Use field verified estimates in resource and transportation project analysis and short-range planning.

2. Methods, Supporting Information. A wide range of information and methods is used to develop preliminary cost estimates. The format and resulting cost estimates vary accordingly. Document methods and supporting information in the project record.

3. Range of Reliability. The actual construction cost for any project can vary significantly from estimates made during the planning, location, and design phases. The reliability of an estimate is directly influenced by the type, accuracy, and extent of information available to the planner or the estimator. In this context, the degree of reliability is controllable or reasonably predictable based on the supporting information used to prepare the estimate.

There are factors affecting construction that are difficult to predict. Items such as project location, amount of competition, and the general state of the economy can have significant effects on the range of reliability of cost estimates. Examples of outside factors likely to significantly influence the reliability of preliminary cost estimates are:

a. Fuel costs.

b. Wage rates.

c. Interest rates.

d. Materials costs (especially asphalt products, concrete, and steel prices).

e. Consumer price index and construction cost indices.

f. Other related construction activity in the project area.

g. Time of the year in which work is advertised and awarded.

h. Windows of operation and environmental constraints.

4. Displaying Accuracy of Preliminary Cost Estimates. The costs displayed in planning, estimating, or programming and budgeting documents should not suggest a higher degree of accuracy and reliability than the underlying data supports. Estimates of total project costs should be displayed no more accurately than the nearest 10 percent (that is, for projects worth estimated to cost around $100,000, show the estimate to the nearest $10,000.)

5. Aids to Preliminary Cost Estimating. Cost estimation aids may include: recent project costs or bid tabulations, regional or local cost guides, industry standard estimation guides, other Federal agency costs guides, suppliers of material and equipment, rental companies, and so forth.

74.2 - Engineer's Estimate (Final Cost)

Development of a final cost estimate requires the final selection of pay items, cost estimating method, and time of construction.

Preparation of the estimate should be commensurate with the standard and complexity of the project. Avoid detailed involved estimates for less complex projects that include standard specifications and common construction methods and materials.

Establish unit costs and the estimated total cost using one or a combination of the following methods:

1. Constructed Costs. The constructed costs method uses production rates, labor and equipment costs, overhead, profit and risk, taxes, and material costs. Derive unit costs using local or regional cost guides or other appropriate references. Determine production rates from sources such as equipment manufacturer's technical data or documented local experience. Adjust production rates when significant changes occur in construction methods, equipment, or site conditions. Use production rates to determine how much labor and equipment time is necessary to complete an item of work. Include allowances for materials, taxes, supervision, and profit.

2. Historical Bids. The historical bids method uses data collected from bids received on previous construction projects to determine unit prices. Estimators should not use historical bids as a basis for estimating items with a small data base or items that are unique to a specific project. Straight averaging of all bids may not be representative of actual costs.

   Use judgment when determining what bids to include in the bid averages. High and low bids are often excluded, especially if those bids indicate excessive departures from the norm. Unit prices often vary with the quantities involved. It may be advisable to develop separate averages based on different quantity ranges for similar work.

The following apply to all cost estimating methods and procedures:

1. Document method and source data.

2. Be as accurate as warranted by the risks, values, and costs involved.

3. Identify and adjust estimates to reflect differences between public works and local logging industry wage rates only when local logging industry wage rates are lower than public works wage rates.

4. Be consistent with regional and/or local cost guides.

5. Include the cost of construction induced maintenance in specified roads for timber sales.

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

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

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

b. Taxes. On purchase of material.

c. Bonding cost. (May be included in mobilization).

d. "Standby time" for equipment and operators. That are part of a "spread" performing a segment of work, but who are not working at full capacity all the time. For example, during placement of aggregate, a grader, roller, and water truck are needed. The grader and roller may be operating full time; the water truck only part time. The estimate should include standby time for the water truck to compensate for having it available on the job during the entire time of placing aggregate.

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

f. Permit fees.

2. Rounding of Unit Costs. Round off the unit price to the nearest significant figure. A good rule of thumb is to compare the rounding of unit costs with the significant figure of the quantity or value of the item. For example, clearing costs measured to a tenth of an acre generally should be rounded to the nearest $10 or $25. Excavation costs should be rounded to the nearest $.10 per cubic yard, and culvert costs should be rounded to the nearest $.50/lineal foot

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

4. Time Estimates. In accordance with Section 52.212-3 of the Federal Acquisition Regulations (FAR), 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 winter shutdown time. Also consider fire season, environmental restrictions, and reasonable

delays. 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.

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

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

Davis-Bacon and Service Contract Wage Rates are found at:
http://www.access.gpo.gov/davisbacon. (Davis-Bacon Wage Rate Web site) and
http://www.wdol.gov (Service Contract Act Wage Rate Web site).

6. Timber Sale Purchaser Wage Rate Adjustments. For Purchaser Wage Rate Adjustment Factors, refer to regional guidance related to local timber wage rates to calculate Specified Road Costs.

7. Small Quantity Adjustments. Estimates should consider all roads that are included in a contract package that are within a 5 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 or asphalt materials are involved. Mobilization of equipment may exceed the direct costs of the material itself. Small construction projects may have a relatively high mobilization cost for transport of dozers, excavators, and other specialized equipment.

8. Deviating From Cost Guides. If the production rates are not valid for the anticipated work, use the "time and equipment" method of costing. When local, verifiable conditions indicate costs are different from those shown in regional cost guides, local costs should be used. Any deviation from regional guidance must be documented and included in the project file.

9. Profit, risk, and overhead. An acceptable rule of thumb for Public Works and Timber Sales Contracts is to use 23 percent for estimating Profit, Risk, and Overhead.

10. Bonding. A 2 percent rate for bonding may be included in Mobilization for Public Works Contracts. Do not include bonding for Timber Sale Specified Roads, as it is included in the Timber Sale contract.

11. Materials costs. When obtaining direct quotes for materials, include profit and risk, sales taxes, shipping, and so forth. Some States have sales tax which must be accounted for in materials costs.

12. Equipment rental costs. When obtaining direct quotes for specialized equipment, include profit and risk, taxes, delivery, and so forth. Some States have equipment rental tax plus local taxes which must be accounted for in equipment rental costs.

13. Subcontracting. An additional 10 percent should be added to the pay items normally subcontracted to reflect the contractor's/purchaser's additional profit, risk, overhead, insurance, and so forth.

Occasionally, a contractor/purchaser is not equipped to perform the work specified and will likely utilize subcontractors. Cost estimates should consider that subcontractor's employees may be paid higher wages than the contractor/purchaser's employees under the contract wage decision.

Examples of construction work items commonly subcontracted are:

a. Construction staking.

b. Material testing.

c. Aggregate crushing.

d. Bituminous pavements.

e. Portland cement treated base.

f. Permanent bridge construction.

g. Concrete.

h. Treated timber.

i. Steel.

j. Reinforced earth walls.

k. Retaining walls.

l. Hydro-mulching (seeding, mulching, and fertilizing).

Apply wage rates that are applicable to the specialized work and document rationale for applying such wage rates.

14. Cost Projection Factor. Regional offices may issue cost trend projection factors applicable to existing regional cost guides in response to changes in conditions.

15. Construction-Induced Maintenance (FSH 7709.59, sec. 63.42).

Construction-induced maintenance includes all maintenance work on National Forest System roads resulting directly from traffic necessary for transportation of materials, equipment, and personnel to or from a construction project.

16. Miscellaneous Items.

a. Contractor quality control. This work is typically not measured for payment but is included as indirect payment under other pay items.

b. Maintenance of roads required by the construction contract, including dust control. This includes routes under construction as well as roads used to detour traffic.

c. Fire prevention and control provisions required by the contract in relation to contract time and slash disposal methods.

e. Erosion control or other water-quality preservation measures required by the contract.

f. Temporary traffic control requirements such as warning signs, flaggers, pilot cars, detours, and barricades required by the contract.

g. Other Special Project Requirements that may be included in the Federal Acquisition Regulation contract format under contract administration provisions or Special Contract Requirements in the Public Works Contract or the "B" and "C" Provisions of the Timber Sale Contract, such as wildlife, Native American ceremonial sites, archaeological values, special management areas, proximity to wilderness, and other restraints.

Typical production rates may not apply to small projects and/or remote projects. In those instances, time and equipment rates must be used to prepare the estimate rather than using typical production rates.

General costing sources for wages and equipment:

1. Construction Wage Rates.

a. Wages are obtained from U.S. Department of Labor (Davis Bacon (DB) Premium Rates). Premium rates include base rate plus fringe plus travel zone differential. See http://www.access.gpo.gov/davisbacon/.

b. Wage rates are divided into three categories of labor: Power Equipment Operator, Truck Driver, and/or Laborer from Davis Bacon Wage Decision.
See http://www.access.gpo.gov/davisbacon/.

c. Some States publish Davis Bacon Timber Sale Roads Rates.

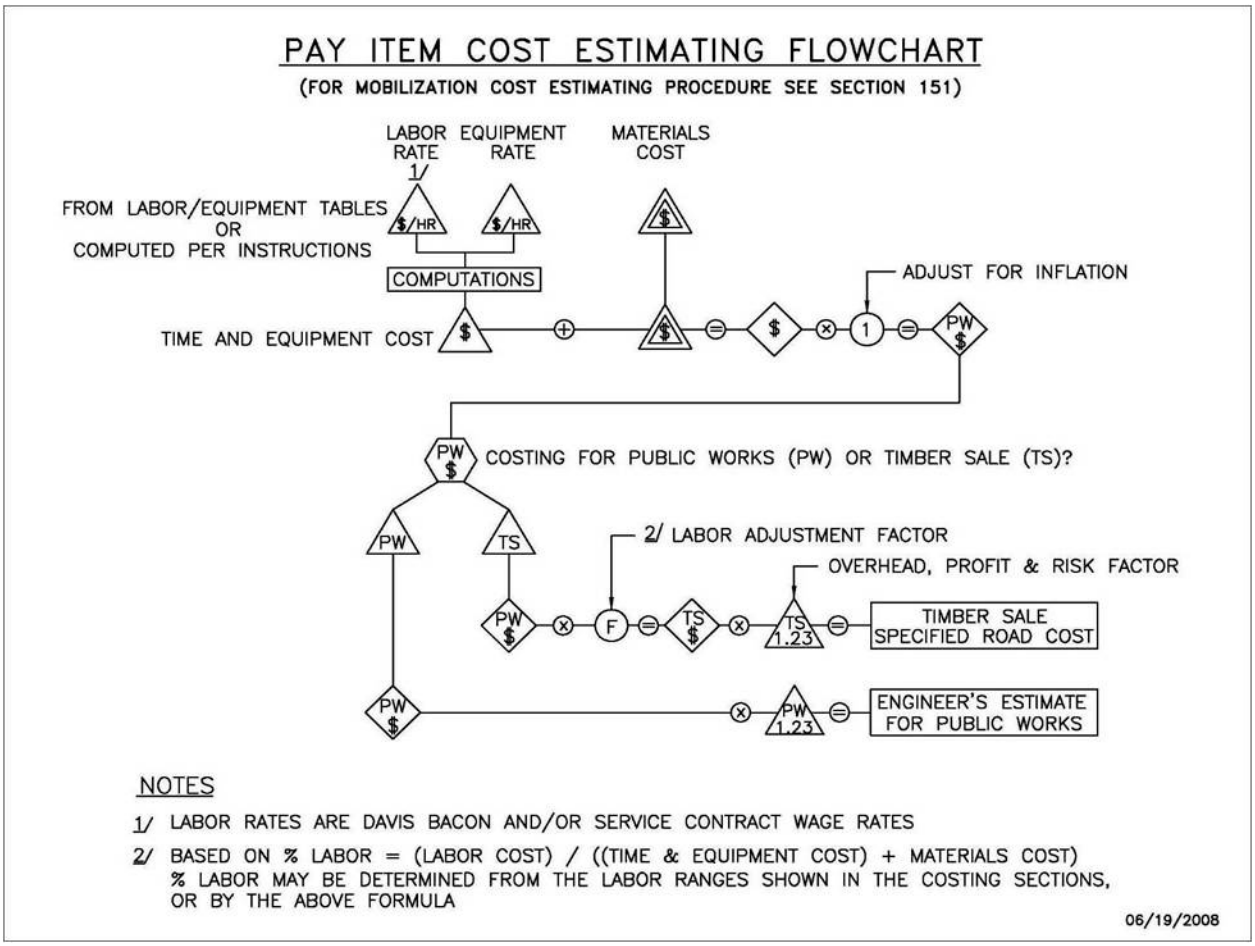
2. Service Wage Rates. Wage rates for Surveyors are determined from Service Contract Act. See http://www.wdol.gov/.

3. Equipment Rates. Various sources and vendor quotes may be used. An example that utilizes ownership rates for Oregon, Washington, and Idaho is found in the Army Corps of Engineers database located at http://www.usace.army.mil/publications/eng-pamphlets/ep1110-1-8(vol8)/entire.pdf.

A flowchart of the pay item estimating procedure is shown in exhibit 01.

74.2 – Exhibit 01

Flowchart of the pay item estimating procedure



For timber sale projects, the specified road cost is the road cost estimate for a public works contract adjusted to reflect the difference between public works wage rates and local logging industry wage rates.

Do not adjust the cost for items that purchasers are required to perform if both of the following conditions apply:

a. The work is likely to be subcontracted.

b. The subcontractors are likely to pay Davis Bacon wage rates.

Determine the specified road cost for a pay item by applying the following two elements:

1. Labor Percentage. The labor percentage is that portion of each construction pay item cost attributable to labor as determined by analyzing the costs of labor, materials, and equipment for each item (ex. 02).

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

For example, for Davis Bacon Area X, the wage ratios are determined from the Public Works Wage Rate and the local logging industry weighted average wage rate as:

	Laborer	Tractor Operator
Public works wage rate:	$23.12	$29.19
Local logging industry		
Weighted average wage rate:	$14.92	$18.71

Wage ratios are determined as follows:

$\frac{\$29.19 \text{ Public Works tractor operator wage rate}}{\$18.71 \text{ Local logging industry weighted average wage rate}} = 1.56$ Timber Sale Wage Ratio

Engineer's Estimate Adjustment For Timber Sale. The costs derived in the following example show a Public Works Engineer's Estimate based on Davis-Bacon Area (DBA) Premium wage rates as published by the Department of Labor. Adjustment may be required when converting a Public Works estimate to a Timber Sale contract estimate.

Adjust the cost estimate to determine the Specified Road Cost using the following formula:

$$C_{TS} = C_{PW} - (C_{PW} \times L_P) + \frac{C_{PW} \times L_P}{W_R}$$

where:

C_{TS} = Timber sale pay item cost.

C_{PW} = Public works pay item cost.

L_P = Labor percentage - decimal equivalent
(see 74.2 ex. 02 Typical Labor Percentages)

W_R = Wage ratio

Example:

Pay Item	Public Works Estimate	Labor Percentage	Wage Ratio	Specified Road Cost
Clearing and Grubbing	$20,000	45	1.56	$16,769

Calculations:

$$\text{Specified Road Cost} = 20{,}000 - (20{,}000 \times .55) + \frac{(20{,}000 \times .45)}{1.56} = \$16{,}769$$

74.2 - Exhibit 02

Typical Labor Percentages

Work Item	Labor Percentage[1]	Low Percent Factor	High Percent Factor
Clearing and Grubbing	40-55	Small Trees Thin Underbrush Flat Terrain Good Soils Scattering and Windrowing	Large Trees Dense Underbrush Mountainous Terrain Rocky Areas Burn or Haul
Excavation and Embankment	20-30	Gentle Terrain Good Soils No Blasting Short Haul	Steep Terrain Rocky Soils Blasting Long Haul
Aggregate Base and Surfacing	25-45	Large Quantities Double Lane	Small Quantities Single Lane
Asphalt Surfacing	20-30	Large Quantities	Small Quantities
Minor Concrete Structures, such as Headwalls	25-45	Unfinished	Rubbed Finish
Drainage Pipe	25-45	No Bedding No Trenching 18" to 36" Diameter	Bedding Trenching 42" to 60" Diameter
Seeding and Mulching	35-50	Hydroseeding Flat Slopes Water Close By	Hand Seeding Steep Slopes Haul Water
Mobilization	20-40	Minimum Set Up Time	Labor Intensive Project Preparation

1/ These are general labor percentages. Adjust the percentages for specific cost guide areas.

74.3 - Time Estimates and Cost Projections

In conjunction with the project cost estimate, prepare a schedule that estimates the time necessary to construct the project and shows the most reasonable time for the various construction activities to occur. Include seasonal restrictions and construction windows specified for resource protection.

When the construction of specified roads in a timber sale contract can be turned back to the Forest Service, consider the effect on required road completion dates. Allow sufficient time for the Forest Service to prepare and award a public works contract. Refer to 36 CFR 223.84g.

74.4 - Documentation

Document all road cost estimates. The cost guide and project file serve as the complete documentation of the estimate. Retain the following material in project cost estimate files:

1. Identification of cost guide(s) or other sources used to prepare the estimate.

2. A listing of quantities and unit costs used to prepare the estimate.

3. Manufacturer's data from sources other than the cost guide.

4. All calculation sheets, cost data, including those for pay item unit prices, production rates, material costs, construction time, midpoint of construction, profit and risk, overhead, taxes, and cost trend projection.

5. A copy of the final approved estimate.

74.5 - Qualifications of Estimators

Only persons with sufficient training, experience, and knowledge in construction methods, practices, and costs (FSM 7721.04c) should prepare cost estimates. Estimates prepared by inexperienced personnel must be reviewed and approved by qualified individuals.

74.6 - Approval of Road Cost Estimates

Review and approve road cost estimates in accordance with FSM 7721.04c. Thoroughly check all items of work, quantities, calculations, and background data. Calculations sheets must be signed and dated by the preparer and reviewer.

74.7 - Cost Estimates for Opted Road Construction

Maintain the integrity of the engineer's estimate advertised in a timber sale when advertising for public works construction of opted roads. The estimate for the public work contract, for an opted timber sale, may be different from that shown in the prospectus for the timber sale advertisement when:

1. Errors or omissions in quantities or cost become evident during the preparation of the public works packet.

2. Physical changes occur between the timber sale offering and public works advertisement that are beyond the control of the Government, such as blowdown or storm damage.

3. Unanticipated delays occur during the process of obtaining public works bids that require extending the timber sale award.

4. Changes are made to accommodate any differences between the timber sale and public works contracts.