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1995 *Engineering Field Notes* Article Award Winners

Our sincere thanks to all who took the time to cast a vote for the 1995 *Engineering Field Notes* articles. In these times of doing more with less, we appreciate your taking the time to thank our authors by voting.

A very special thanks, also, to everyone who submitted an article. To continue as a valuable resource to personnel in the field, we need people who have time for others, people who are willing to share. We depend on you to share your knowledge, experiences, successes, and failures. According to our voters, your articles continue to save the Forest Service time and resources.

And now, the moment you've all been waiting for! The recipients of the cash awards for submitting the winning 1995 *Engineering Field Notes* articles are:

- Carol Grimaldi, for "Improving Culvert Entrances to Increase Flow Capacity"
- Barry Napier, for "North American Datums—NAD27 and NAD83"
- Pete Bolander, for "Stabilization and Standard and Nonstandard Stabilizers: Road Operations and Maintenance Workshop (Colorado Springs, May 1995)"

Congratulations, *Engineering Field Notes* authors! Let's keep those articles coming!

A History of the Forest Highway Program

Richard Sowa
Chief Transportation Development Engineer
Washington Office Engineering

In light of efforts begun regarding the reauthorization of the Intermodal Surface Transportation Efficiency Act of 1991, it seemed like a good time to provide a review of the Forest Highway Program and some of its history.

My intent, with this brief and limited review, is to outline some of the significant laws and acts that have influenced the Federal Highway Program, to put into context the relationship between the various highway acts and the Federal Highway Program, and, at the end, to explain its value to the Forest Service.

The history of the Forest Service and the Federal Highway Program begins a long time ago. I was really tempted to begin this article with "Once upon a time ..." but, in an effort to avoid the dramatic, the following is offered.

The seed of organization that would grow into the Forest Service was sown more than 100 years ago in the Forest Reserve "Creative" Act, signed on March 3, 1891. In this act, Congress authorized the creation of forest reserves, now called national forests. The reserves were set apart to ensure a permanent national timber supply; to preserve scenic and wilderness areas for recreational use by the public; and to safeguard the steady flow of streams that supply water for domestic, agricultural, and industrial use. A pretty good purpose right from the start!

On October 3, 1893, the Office of Roads Inquiry was established in the Department of Agriculture. There were two employees. General Roy Stone, the first special agent and engineer, had the mandate to advise State and local officials on the best methods for improving their roads. This was the first formal step taken by the Federal Government that demonstrated its commitment to transportation—a commitment that has not diminished.

On February 1, 1905, the Transfer Act shifted the responsibility for management of the Nation's forest reserves from the Department of the Interior to the Department of Agriculture. While the value of the transfer of leadership can be argued, the land-use ethic that was established cannot. The Secretary of Agriculture, James Wilson, endorsed the conservation philosophy—wise land use and service to the American people—of our first chief, Gifford Pinchot. The forest reserves were to be managed for the greatest good, for the greatest number of people.

The Agriculture Appropriations Act of 1912 provided that 10 percent of all moneys received from the national forests during each fiscal year be

available for construction and maintenance of roads and trails on the national forests. This provision was made a continuing appropriation in 1913; with that, a sustained source of revenue for road improvement purposes in the public domain was finally available.

Also in 1913, a formal arrangement was made with the Office of Public Roads to manage road work on the national forests.

The Federal-Aid Road Act of 1916 defined Federal participation in forest road construction. This act appropriated $10 million—$1 million per year for 10 years—for the "... survey, construction, and maintenance of roads and trails within or only partly within the national forests when necessary for the use and development of resources upon which communities within and adjacent to the national forest are dependent." This act established the Federal Government's commitment to providing access to and through the national forests.

The Federal Highway Act of 1921 clearly defined two types of forest roads: forest development roads, or those forest roads needed primarily for management of the national forests, and forest highways, or those forest roads that served the national forests and also the communities within and adjacent to the national forests. These definitions made a clear distinction between roads needed for the administration and management of the national forests and roads needed for forest user access.

The next 30 years of highway legislation showed increased emphasis on funding roads that went to or through Federal lands. In 1924, funding for roads, trails, and bridges in national parks began. In 1930, funding for roads serving Indian lands began. In 1941, defense access roads were funded. Finally, in 1950, roads serving or within public lands administered by the Bureau of Land Management were funded.

Beginning in 1958, funds were made available for expenditure in the various States according to an apportionment formula based on the area and value of the national forests in each State. Funds apportioned through this formula could be used only in the State to which they were allocated.

The Department of Transportation Appropriations Act of 1967 created the Department of Transportation, and the Bureau of Public Roads became the Federal Highway Administration.

The 1970 Highway Act required that forest highways be funded from the Highway Trust Fund. Prior to that, they were funded out of the general fund. The act also required that forest highways be on the Federal-aid system. This requirement really limited the opportunities to fund necessary access to the national forest lands.

At the time, most forest highway construction funds were spent on routes that were of primary importance to the States, counties, or communities within or adjacent to the national forests. In fact, most forest highway routes were of statewide importance and became primary highways within their States. In 1977, this was recognized in a General Accounting Office report that stated that the Forest Highway Program was not meeting the

access needs of the National Forest System and directed the Federal Highway Administration and the Forest Service to jointly develop revised legislation and new regulations for the administration of the program.

The first changes to the Forest Highway Program were felt in the 1978 Surface Transportation Assistance Act. In a number of ways, this act changed the direction of the program. First, it clarified the definitions of forest development roads and forest highways. It defined forest development roads as forest roads under the jurisdiction of the Forest Service. It defined forest highways as forest roads under the jurisdiction of, and maintained by, a public authority and open to public travel. Second, it removed language that stated requirements that such routes be of primary importance to the States, counties, or communities and that they be on the Federal-aid system.

The new direction was clear. Forest highways were roads necessary for access to the national forests but not owned or maintained by the Forest Service, and not necessarily on the Federal-aid system. Significantly, a source of funding, outside of the Federal-aid system, was made available for this local forest-access road system.

The primary effect of this new direction was an increased Forest Highway Program emphasis on local roads. It moved the Forest Service appropriately into partnership with local road agencies in the development of the forest highways.

The 1982 Surface Transportation Assistance Act (enacted January 6, 1983) created the Federal Lands Highway Program under the Federal Highway Administration. The primary purpose of this program was to provide funding for public roads that served the transportation needs of Federal lands and were not the responsibility of State or local government. It brought together a consolidated, coordinated, long-range funding program consisting of four categories: park roads and parkways, Indian reservation roads, forest highways, and the Public Lands Highways, Discretionary program.

The multiyear authorization proved especially valuable because it created an opportunity to develop realistic long-range programs. It also allowed time for transportation planning and for developing sound road improvements in the unique environment of Federal lands. Additionally, it changed the way Federal Lands Highway Program funds were distributed. For forest highways, it ordered the Secretary to allocate funds according to the relative needs of the various elements of the national forests. This changed the distribution of funds from an apportionment formula to an allocation based on need.

An inventory and needs study of the newly designated forest highway network was conducted by the Federal Highway Administration in 1982 and 1983 to determine the cost of improving the network in each State. In addition, task groups of Forest Service and Federal Highway Administration personnel identified other factors used to determine forest highway fund allocation. These additional factors included value of forest resources, recreation visitor days, volume of timber harvested, and acres of national

forest. These factors, along with improvement costs from the inventory, were used to develop new formulas that were used to allocate fiscal year 1984 forest highway funds. The relative-need formula adopted was based on one-quarter recreation visitor days, one-quarter timber harvest, and one-half forest-related improvement costs.

The 1984 Department of Agriculture Appropriations Act required forest highway funds to be allocated using the old area-value formula for the first $33 million (66 percent) of the annual authorization; the new relative-need formula developed by the Federal Highway Administration and the Forest Service was used for the remaining $17 million (34 percent). This provision was also used to allocate forest highway funds in fiscal years 1985 and 1986.

The 1987 Surface Transportation and Uniform Relocation Assistance Act continued the Federal Lands Highway Program and increased the annual forest highway authorization from $50 million to $55 million for fiscal years 1987 through 1991. The act stated that Federal highway funds would be allocated in the same manner as in fiscal years 1985 and 1986.

The most current transportation act affecting the Forest Highway Program is the 1991 Intermodal Surface Transportation Efficiency Act. This act did not significantly change the Federal Lands Highway Program, but it did result in some far-reaching changes to other portions of the transportation program. For example, there was an overall attempt to broaden the scope of transportation planning and implementation. The act focused on statewide and metropolitan area planning, rural development, caring for the environment, and transportation enhancements. It established the National Highway System, gave the States and local governments more input into program development, provided funding to help develop new technologies, and directed how Highway Trust Fund distributions were to be allocated.

The Intermodal Surface Transportation Efficiency Act has been around for 6 years, and it has been found to be effective for the programs that the Forest Service uses. It looks like reauthorization efforts will focus on fund-allocation formulas and ways to streamline program delivery, leaving the majority of the program in place as it exists.

Throughout the history of the Forest Highway Program, its intent and purpose have become more clearly defined. It has become a program intended not just to provide safe and adequate transportation access to and through National Forest System lands for visitors, recreationists, resource users, and others—access which is not being provided by other transportation programs—but also to assist in rural and community economic development and to promote tourism and travel.

Since the enactment of the Intermodal Surface Transportation Efficiency Act in 1991, about $430 million in forest highway funds has been made available under the Federal Lands Highway Program. There are nearly 48,000 kilometers of roads and more than 4,300 bridges on the forest highway network. Because these roads and bridges are owned by non-Federal agencies such as States and counties, they are not eligible for Forest Service appropriated funding.

The Forest Highway Program is critical for providing adequate access to the National Forest System. The need to continue funding for that interface is growing rapidly. A 1995 inventory of the status of the forest highway network indicated that 20 percent of the paved roads are in good condition, 60 percent are in fair condition, and 20 percent are in poor condition. The overall condition will decrease over time, with higher percentages of the roads moving into the fair and poor categories as funds remain static.

Cost Estimators in Region 6 Join FORCES To Get the Job Done

John Johnston
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Region 6, Malheur National Forest

Introduction

What is FORCES? The acronym stands for Forest Optional Road Costing Engineering System. FORCES—

- Is a PC-based cost estimating system.
- Uses databases from the Region 6 Cost Guide.
- Uses historical or time and equipment costing methods.
- Uses a commercial spreadsheet—Microsoft's Excel.
- Can be modified by the user to fit local conditions.

Background

Over the years, cost estimating has seen many changes and improvements. We've come from the slide rule, to the old Monroe hand crank, and on to the fancier handheld calculators. In recent years, there have been attempts to develop a cost-estimating system for use on personal computers. However, none of these seemed to get off the ground because of the complexity of the overall effort.

During the 20 years I have been involved with cost estimating, I have often wondered why we have to be so complex in everything we do when it is required only on occasion. In short, why not develop a cost-estimating system that could handle the most frequently used specifications while allowing estimators to customize the system to meet their specific needs?

Objective

Prior to the development of FORCES, a survey was conducted to find out what users believed were the most important attributes of a costing system. The number one response was, "make it friendly"; number two was, "get it to us now so we can use it today." In my spare time, I began to develop a simple-to-use basic cost-estimating system. That was in the summer of 1994. FORCES (an assortment of more than 40 worksheets) was introduced in the spring of 1995. Today, it is being used throughout Region 6, with inquiries from Regions 1 and 2.

Specifications

To take advantage of FORCES, you must have Microsoft Excel or equivalent software and the following minimum system components:

- IBM PC compatible with hard disk and 80286 processor or higher.
- At least 4 megabytes of random-access memory (RAM).

- MS-DOS version 3.1 or later, and Microsoft Windows version 3.1 or later in standard or enhanced mode.
- Graphics display compatible with Microsoft Windows version 3.1 or later, such as EGA or VGA.

A printer is optional; a Microsoft mouse or compatible pointing device is recommended.

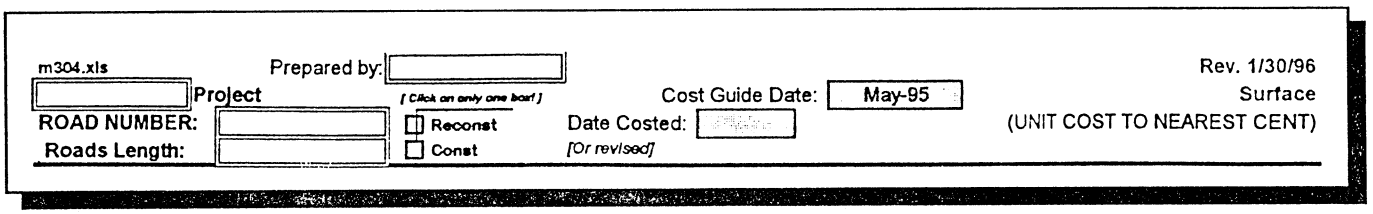
Concept

Rather than use a programming language, an established software application was used to provide a system that was not locked to one individual or group of individuals. In this manner, it is presumed that the product will evolve as needed because it can be modified to fit the needs of the user. For those familiar with Windows and spreadsheets, FORCES will be a snap. For those just beginning on the PC, it may take 10 to 15 minutes to become familiar with the how to's. It's that easy!

Color was added in the development of FORCES and plays an important role in its use. There are currently more than 40 worksheets available for use, covering pay items from construction staking to road-closure devices. These worksheets were designed so that cells available for use are double-outlined in RED. Those screened in GRAY either contain hard-coded data or are linked to other cells that are providing linked data.

Examples

At the beginning of each sheet, the header information is pretty basic, calling for such information as the estimator's name, the name of the project, and the duration of the project:



The need to understand Excel for the purpose of negotiating through these costing worksheets is minimal. If there is a red or blue double-outlined box, check to see if you need to insert data. If so, put the mouse pointer in the box and click, type in the data, then press the ENTER key. You may need to check boxes as well as input figures to link the system to the proper tables from which it will pull various prices and factors that comprise a component of the overall price. If you wish to mark one of the small black boxes with an X, when the mouse pointer is a small hand, click with the mouse's left button. Click on just one box per group. This information is used to formulate the appropriate costs.

You will not be able to enter anything in the gray boxes. The worksheets have been protected so the formulas or hard-coded data in these gray boxes cannot be deleted accidentally. A key point to remember in using the worksheets is: if, after inputting a figure in a cell, you decide you want the cell left blank, *do not* go back to that cell and use the space bar to type over your data. *Use the DELETE key!* If you use the space bar and the data

are required for use in a formula, the system ends up trying to divide, subtract, or whatever by a space instead of a blank.

Some use has been made of drop-down boxes to facilitate a broader use of time and equipment. With the smaller projects, particularly watershed restoration, this time and equipment approach is fast becoming one of the more popular worksheets. Here, all you have to do is identify the group (such as labor); click on or select the down arrow; from the list, select what fits your needs; and enter the number of hours needed. You are always in control of these worksheets!

Exhibits 1, 2, and 3 on the following pages are examples of the worksheets. As you can see, the places where you need to enter information are easy to spot because the cells are double outlined. On the monitor, they will be even easier to spot because they will show up in red or blue.

Benefits

FORCES has the advantages of—

- Being available.
- Being user friendly.
- Requiring no special skills.
- Being a vehicle for consistency.
- Eliminating math errors.
- Providing professional-looking reports.
- Handling revisions easily.
- Storing and retrieving data easily.
- Providing a historical database.

Summary

FORCES is being used now with success and is in step with doing more with less, which, in our current mode of downsizing, is a necessity. It is an economically practical alternative. Should FORCES not migrate to 615, we will continue to have PCs to support AutoCad, so the program will not be obsolete within a couple of years.

Future

Region 6 is developing a new Regional Cost Guide program for release during the winter of 1996–97. Upon completion, FORCES could be linked to it, eliminating the need for manual updating when new equipment and labor rates are introduced.

Conclusion

The system works! It is definitely worth a try. If you are interested in other uses of the spreadsheet approach to everyday tasks, such as road plans and specification lists, as well as some special projects that I have put together to graphically display such things as accomplishment reports, give me a call. See Exhibits 4 and 5 for examples of the Design Change form and the Maintenance Costing forms that we use on the Malheur National Forest.

m170.xls | Prepared by: | Rev. 1/28/96

Project | [Click on only one box] | Cost Guide Date: May-95 | Prism

ROAD NUMBER: | ☐ Reconst | Date Costed: | (UNIT COST TO NEAREST CENT)

Roads Length: | ☐ Const | [Or revised]

☐ Stations [Only as Needed] ☐ Miles [Always need to input miles !]

Method of Measurement - AQ

Pay Item [Click on only one box]

☐ 170(03) Precision A, Method n/a	☐ 172(02) Precision D, Method I	
☐ 170(03) Precision B, Method n/a	☐ 172(02) Precision E, Method I	2/
☐ 170(03) Precision C, Method n/a	☐ 172(02) No Precision, Method II	2/
☐ 171(02) Precision C, Method I	☐ 173(01) No Precision, Method n/a	1/
☐ 171(02) Precision D, Method I	☐ 173(02) No Precision, Method I	
☐ 171(02) Precision E, Method I	☐ 173(02) No Precision, Method II	2/
☐ 171(02) No Precision, Method II		1/

1/ ☐ When staking both sides, click on 171(02) Method II to adjust the Basic Cost per Mile.

2/ ☐ Cost per mile is based on staking one side only. When staking both sides click on this box.

Ground Cover [Click on only one box]

- ☐ Open Stands of Pine
- ☐ Thick Stands of Pine
- ☐ Open Stands of Fir
- ☐ Thick Stands of Fir
- ☐ Reprod >6' Spacing
- ☐ Thick Reprod <6' Spacing
- ☐ Hardwood Underbrush
- ☐ Alder Patches

Terrain [Click on only one box]

- ☐ 0% - 30%
- ☐ 31% - Full Bench
- ☐ Full Bench

Sections/Mile [Click on only one box]

- ☐ Under 60
- ☐ 60 - 100
- ☐ Over 100

What is the total daily round trip (foot access) travel t[illegible]?

Adjustment to Basic Unit Cost (1 hour RTTT is Includ[illegible]:

Total travel	- Included hr	=	=	= Basic Unit Cost
1.0	1.0	0.00	[illegible]%	$ -

[[illegible]% Adj/[illegible] hr travel]

Ground Cover Factor	+ Side Slo[illegible] Factor	+ Sections/[illegible] ctor	+ 1.00	x Adj Basic Unit Cost	x Total Miles	= Basic Total
				$ -		$ -

Basic Total	x 2/	= Adjusted Basic Total	/ Total Units	= Premium Unit Rate
$ -	100%	$ -		$ -

[Click on box if applicable]

☐ Subcontractors Adjustment: | Premium Unit Rate $ - | x 10% Adj 110% | = Adj Premium Unit Rate $ -

Notes: [Click in lower box and type]

Premium Unit Rate	x Units	= Premium
$ -		$ -

1.56 Davis Bacon Ratio | 0% Labor Range

MAL 170-Prism JJ111594

1

EXHIBIT 1

m304.xls Prepared by:

Project [Click on only one box!] Cost Guide Date: May-95 Rev. 1/30/96

ROAD NUMBER: ☐ Reconst Date Costed: Surface

Roads Length: ☐ Const [Or revised] (UNIT COST TO NEAREST CENT)

304( ) ___ Aggregate, [Click on only one box] ☐ Pit Run ☐ Grid Roll ☐ Screened ☐ Crushed

Type, [Click on only one box] ☐ Surface ☐ Base Max Size: [Click on only one box] ☐ 2" ☐ 4" ☐ 6" PitRun/GridRoll Only Compaction: Click on only one box ☐ A ☐ B ☐ C ☐ D ☐ E ☐ F

Gradation: Click on only one box

☐ A ☐ B ☐ C ☐ D ☐ E ☐ F ☐ G ☐ H ☐ J ☐ K ☐ L ☐ M ☐ N ☐ O ☐ P ☐ Q ☐ R ☐ S ☐ T ☐ U ☐ V

C.Y. - DQ- = Tons - VQ lbs/Ton ☐ Lump Sum - LSQ

Truck Size: [Click on only one box] ☐ 12/10 CY ☐ 20/18 CY ☐ 25/25 CY [Use w/light Mat'l only, ie. cinders]

Cu. Yd.'s Compacted [In Place] x Swell Factor = Cu. Yd.'s Noncompacted

		Cu.Yd.		$/C.Y.		(Sub Total)	
Preproduction:							
Drill and Shoot	%	-	x		=	$ -	
Ripping	%	-	x	$ 0.59	=	$ -	
Grid Roll		-	x	$ 0.35	=	$ -	
Crushing:							
Cobbles	%	-	x	$ -	=	$ -	
Rippable	%	-	x	$ -	=	$ -	
Solid	%	-	x	$ -	=	$ -	☒ Preproduction Subcontracted
Production:							
Scalping	%	-	x	$ 0.20	=	$ -	
Grid Roll		-	x	$ 0.50	=	$ -	
Pit Run		-	x	$ 0.50	=	$ -	
Screened		-		$ 1.76	=	$ -	
Stockpile	%	-	x	$ 0.79	=	$ -	
Load from Pile	%	-	x	$ -	=	$ -	☒ Production Subcontracted

Average Haul Calculations:

$ - Fixed Cost + (Road Number / Avg Haul Miles x MPH $ - / MPH Cost) + (Road Number / Avg Haul Miles x MPH $ - / MPH Cost) +

(Road Number / Avg Haul Miles x MPH $ - / MPH Cost) + (Road Number / Avg Haul Miles x MPH $ - / MPH Cost) + (Road Number / Avg Haul Miles x MPH $ - / MPH Cost)

(Road Number / Avg Haul Miles x MPH $ - / MPH Cost) + (Road Number / Avg Haul Miles x MPH $ - / MPH Cost) + (Road Number / Avg Haul Miles x MPH $ - / MPH Cost)

Haul Total Co - x $ - = $ - ☒ Haul Subcontracted

Processing:

Compaction - - x $ - = $ - ☒ Processing Subcontracted

Mixing & Placing: - x $ - = $ - ☒ Mixing & Placing Subcontracted

Testing: $489.00 / ___ CY - *Total Project Noncompacted Crushed Rock*

Fixed Test - x $ - = $ -

T-11 Test - x $ - = $ -

T-27 Test - x $ - = $ - ☒ Testing Subcontracted

Additional Cost for Subcontracting: $ -

Noncompacted CY - Premium Total $ -

Premium Total Noncompacted CY $ - = $ - x ___ Premium Unit Compacted CY

☐ See Attached page for Notes = $ - Premium Total

1.56 Davis Bacon Ratio ___ 27% - 35% Labor Range

MAL 304JJ121294

EXHIBIT 2

Time_Eqp.xls **Prepared by:** _____ **Rev. 1/11/96**

_____ **Project** **Cost Guide Date:** May-95

ROAD NUMBER: _____ **Date Costed:** _____ *[Or revised]* (UNIT COST TO NEAREST CENT)

_____ *Item Number* _____ *Description of Pay Item*

[Click on only one box] ☐ Normal ☐ Clearing — Type of Activity

_____ *Quantity*

[Click on only one box] ☐ Miles - AQ ☐ Stations - AQ ☐ Each - AQ ☐ L.F. - AQ ☐ S.Y. - AQ ☐ C.Y. - DQ ☐ Lump Sum - LSQ

Description	@	Equip Cost/Hr	+	Labor Cost/Hr Normal	Labor Cost/Hr Clearing	=	Sub Total	x	Hrs	=	Sub Total
[Click on arrow and make choice - one per line]									*[Input Hours]*		
LABOR RATES:											
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
ASPHALT EQUIPMENT & OPERATORS RATES:											
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
LOADERS & OPERATORS RATES:											
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
BRUSH CHIPPERS & OPERATORS RATES:											
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
COMPACTION EQUIPMENT & OPERATORS RATES:											
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
DRILL WITH COMPRESSOR & OPERATORS RATES:											
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
EXCAVATORS & OPERATORS RATES:											
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -

EXHIBIT 3

Time_Eqp.xls **Prepared by:** Rev. 1/11/96

Project Cost Guide Date: May-95

ROAD NUMBER: Date Costed: (UNIT COST TO NEAREST CENT)

[Or revised]

Item Number *Description of Pay Item* *[Click on only one box]* ☐ Normal ☐ Clearing Type of Activity

Quantity

[Click on only one box]

☐ Miles - AQ ☐ Stations - AQ ☐ Each - AQ ☐ L.F. - AQ

☐ S.Y. - AQ ☐ C.Y. - DQ ☐ Lump Sum - LSQ

Description	@	Equip Cost/Hr	+	Labor Cost/Hr Normal	Labor Cost/Hr Clearing	=	Sub Total	x	Hrs	=	Sub Total
[Click on arrow and make choice - one per line]									*[Input Hours]*		
GRADERS & OPERATORS RATES:											
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
SCRAPERS & OPERATORS RATES:											
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
TRACTORS & OPERATORS RATES:											
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
DUMP TRUCKS & OPERATORS RATES:											
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
WATER TRUCKS & OPERATORS RATES:											
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
OTHER TRUCKS & OPERATORS RATES:											
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
WATER PUMPS & OPERATORS RATES:											
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
MISCELLANEOUS EQUIP & OPERATORS RATES:											
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -

EXHIBIT 3

Time_Eqp.xls **Prepared by:** Rev. 1/11/96

Project Cost Guide Date: May-95

ROAD NUMBER: Date Costed: *[Or revised]* (UNIT COST TO NEAREST CENT)

Item Number *Description of Pay Item* *[Click on only one box]* ☐ Normal ☐ Clearing Type of Activity

Quantity

[Click on only one box]

☐ Miles - AQ ☐ Stations - AQ ☐ Each - AQ ☐ L.F. - AQ

☐ S.Y. - AQ ☐ C.Y. - DQ ☐ Lump Sum - LSQ

Description		Equip Cost/Hr		Labor Cost/Hr Normal	Labor Cost/Hr Clearing		Sub Total		Hrs		Sub Total
[Click on arrow and make choice - one per line]									*[Input Hours]*		
MISCELLANEOUS EQUIP & OPERATORS RATES:											
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
CRUSHING EQUIPMENT & OPERATORS RATES:											
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -
	@	$ -	+	$ -	$ -	=	$ -	x		=	$ -

EXHIBIT 3

Additional Costs - See Notes Below =

Total Cost $ -

#REF!		$ -	=				
Total Labor		Total Cost		% Labor			
Total Cost							
$ -	=	$ -	x		=	$ -	
				Mi/Sta/Ea/LF/LS			

Notes:

1.56 Davis Bacon Wage Labor Range

Construction Cost Adjustment For Specified Roads Design Change C5.254		Sale Name:	Twinbench Timber Sale	Contract #	71597
Change Number	3670402-II.1	Purchaser:	Boise Cascade		
		Road Name & No.:	3670402-II		
		Project Segment: From Station:		to Station:	

Description of Change:
38+60 - 40+04 Construct side ditch on left.
38+80 - 40+04 Lay 12" of Item 304(10)B with 25' taper from 38+55 to 38+80.
39+01 -40+04 Install 175 S.Y. of geotextile for subgrade reinforcement.
40+95 - 42+75 Lay 12" of Item 304(10)B tapering into full depth drain dip rock
40+95 - 42+87 Construct side ditch on left.

Revised Quantities and Purchaser Credit Affected by Change

Item No.	Description	Method of Measurement	Unit	Quantities			Unit Price		Adjustments		Purchaser Credit Limit	
				Previous	Change Plus	Change Minus	Revised Total	Original	Revised	Plus	Minus	Previous	Revised
203(16).1	Subgrade Treatment, Type 1,2,3,4, Function B	AQ	S.Y.	0	175		175	$ -	$ 1.19	$ 208.25	$ -	$ -	$ 208.25
203(19)C.1	Drainage Excavation, Type Side Ditch	AQ	L.F.	0	336		336	$ -	$ 0.50	$ 168.00	$ -	$ -	$ 168.00
304(10)B.1	Crushed Aggregate, Type Base, Grading F, Comp A	DQ	C.Y.	0	180		180	$ -	$ 13.39	$ 2,410.20	$ -	$ -	$ 2,410.20

EXHIBIT 4

I hereby accept this change as to the work to be performed.

$ 2,786.45 Total net change

Purchaser

Signature Date

Title

Prepared by Date

Title

Approved by Date

Title

MAL C6.254 JJ 060296

Maintenance Work Sheet

Prepared by _____ for the _____ Timber Sale on _____ Date

Allowance for Perchaser Performed Overhead Rate *	15%	Allowance for Purchaser Performed Profit & Risk Rate *	2%	Collection for Deposits CWFS Rate *	28.62%	Total MBF	

NOTE: Rates should be varified each time maintenance costs are developed !

Documentation of C5.42 and C5.43 Allowance for Purchaser Performed and Collections for Deposits calculations are on pages 2 through 5 attached.

Allowance for Purchaser Performed See pg 2 of 6		Allowance for Purchaser Performed See pg 3,4 & 6 of 6		Allowance for Purchaser Performed		Total		
$ -	+	$ -	=	$ -	/	0	=	#DIV/0!
C5.42 Roads 2409.22 415.55–2		C5.43 Roads 2409.22 415.55–4		For All Roads		MBF Vol		Per MBF

Collection for Deposits See pg 4 of 6		Collection for Deposits See pg 6 of 6		Collection for Deposits		Total		Deposits for C5.411
$ -	+	$ -	=	$ -	/	0	=	#DIV/0!
C5.42 Roads 2409.22 415.55–1		C5.43 Roads 2409.22 415.55–3		For All Roads		* MBF Vol		Per MBF

NOTES:

EXHIBIT 5

Maintenance Work Sheet

Page 2 of 6

Prepared by 0 **for the** 0 **Timber Sale on** ____ **Date**

Listing of C5.42 Roads - Allowance for Purchaser Performed - Maintenance Level 3 thru 5

Road Number	Termini		Length	MBF Volume	MBF Miles	Surface Type
	From	To				
						☐ **Asphalt** ☐ **Crushed Agg** ☐ **GR,PR, Native**
						☐ **Asphalt** ☐ **Crushed Agg** ☐ **GR,PR, Native**
						☐ **Asphalt** ☐ **Crushed Agg** ☐ **GR,PR, Native**
						☐ **Asphalt** ☐ **Crushed Agg** ☐ **GR,PR, Native**
						☐ **Asphalt** ☐ **Crushed Agg** ☐ **GR,PR, Native**
						☐ **Asphalt** ☐ **Crushed Agg** ☐ **GR,PR, Native**
						☐ **Asphalt** ☐ **Crushed Agg** ☐ **GR,PR, Native**
						☐ **Asphalt** ☐ **Crushed Agg** ☐ **GR,PR, Native**
						☐ **Asphalt** ☐ **Crushed Agg** ☐ **GR,PR, Native**
				Total MBF/Miles	0	

Asphalt Total MBF Miles: 0 x Allowance Rate: ____ x Overhead and Profit & Risk Rate: ____ = Asphalt Total: $ -

Crushed Aggregate Total MBF Miles: 0 x Allowance Rate: ____ x Overhead and Profit & Risk Rate: ____ = Crushed Aggregate Total: $ -

GR, PR or Native Total MBF Miles: 0 x Allowance Rate: ____ x Overhead and Profit & Risk Rate: ____ = GR, PR or Native Total: $ -

EXHIBIT 5

C5.42 Total Allowance for Purchaser Performed $ -

[To pg 1 of 6]

NOTES:

Maintenance Work Sheet

Prepared by 0 **for the** 0 **Timber Sale on** [ ] **Date**

Seeding	Seeding
$ 50.00	$ 75.00
Cost/Mile	Cost/Acre

Listing of C5.43 Roads - Allowance for Purchaser Performed

[Click on boxes if they are applicable]

Road Data				Haul							Seeding			
Road Number	Seg	Loads	Length in Miles	Pre	Int	Post	Cost/ MBF Mile	Road MBF Vol	Roads Haul Cost	Yes	Width	Acres	Cost	Total Cost
							$ -		$ -			0.00	$ -	$ -
							$ -		$ -			0.00	$ -	$ -
							$ -		$ -			0.00	$ -	$ -
							$ -		$ -			0.00	$ -	$ -
							$ -		$ -			0.00	$ -	$ -
							$ -		$ -			0.00	$ -	$ -
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							$ -		$ -			0.00	$ -	$ -
							$ -		$ -			0.00	$ -	$ -
							$ -		$ -			0.00	$ -	$ -
							$ -		$ -			0.00	$ -	$ -

EXHIBIT 5

Note:

Sub Totals $ - | $ - | $ -

FOR MULTIPLE INTERMEDIATE BLADINGS ENTER ROAD MULTIPLE TIMES!

* IF YOU NEED MORE LINES USE ANOTHER SHEET RATHER THAN ADDING LINES TO THIS ONE *

Plus Overhead 15%

Plus Rofit & Risk 2%

C5.43 Allowance for Purchaser Performed $ -

[To pg 1 of 6]

Maintenance Work Sheet

Prepared by	0	for the	0	Timber Sale on		Date

Seeding	Seeding
$ 50.00	$ 75.00
Cost/Mile	Cost/Acre

Listing of C5.43 Roads - Allowance for Purchaser Performed

[Click on boxes if they are applicable]

Road Data				Haul						Seeding				
Road Number	Seg	Loads	Length in Miles	Pre	Int	Post	Cost/ MBF Mile	Road MBF Vol	Roads Haul Cost	Yes	Width	Acres	Cost	Total Cost
				☐	☐	☐	$ -		$ -	☐		0.00	$ -	$ -
				☐	☐	☐	$ -		$ -	☐		0.00	$ -	$ -
				☐	☐	☐	$ -		$ -	☐		0.00	$ -	$ -
				☐	☐	☐	$ -		$ -	☐		0.00	$ -	$ -
				☐	☐	☐	$ -		$ -	☐		0.00	$ -	$ -
				☐	☐	☐	$ -		$ -	☐		0.00	$ -	$ -
				☐	☐	☐	$ -		$ -	☐		0.00	$ -	$ -
				☐	☐	☐	$ -		$ -	☐		0.00	$ -	$ -
				☐	☐	☐	$ -		$ -	☐		0.00	$ -	$ -
				☐	☐	☐	$ -		$ -	☐		0.00	$ -	$ -
				☐	☐	☐	$ -		$ -	☐		0.00	$ -	$ -
				☐	☐	☐	$ -		$ -	☐		0.00	$ -	$ -
				☐	☐	☐	$ -		$ -	☐		0.00	$ -	$ -
				☐	☐	☐	$ -		$ -	☐		0.00	$ -	$ -
				☐	☐	☐	$ -		$ -	☐		0.00	$ -	$ -
				☐	☐	☐	$ -		$ -	☐		0.00	$ -	$ -
				☐	☐	☐	$ -		$ -	☐		0.00	$ -	$ -
				☐	☐	☐	$ -		$ -	☐		0.00	$ -	$ -
				☐	☐	☐	$ -		$ -	☐		0.00	$ -	$ -
				☐	☐	☐	$ -		$ -	☐		0.00	$ -	$ -
				☐	☐	☐	$ -		$ -	☐		0.00	$ -	$ -
				☐	☐	☐	$ -		$ -	☐		0.00	$ -	$ -
				☐	☐	☐	$ -		$ -	☐		0.00	$ -	$ -
				☐	☐	☐	$ -		$ -	☐		0.00	$ -	$ -
				☐	☐	☐	$ -		$ -	☐		0.00	$ -	$ -
				☐	☐	☐	$ -		$ -	☐		0.00	$ -	$ -
				☐	☐	☐	$ -		$ -	☐		0.00	$ -	$ -
				☐	☐	☐	$ -		$ -	☐		0.00	$ -	$ -
				☐	☐	☐	$ -		$ -	☐		0.00	$ -	$ -
				☐	☐	☐	$ -		$ -	☐		0.00	$ -	$ -
				☐	☐	☐	$ -		$ -	☐		0.00	$ -	$ -
Sub Totals									$ -				$ -	$ -

EXHIBIT 5

Note:

FOR MULTIPLE INTERMEDIATE BLADINGS ENTER ROAD MULTIPLE TIMES!

* IF YOU NEED MORE LINES USE ANOTHER SHEET RATHER THAN ADDING LINES TO THIS ONE *

Plus Overhead	15%
Plus Rofit & Risk	2%

C5.43 Allowance for Purchaser Performed $ -

[To pg 1 of 6]

Maintenance Work Sheet

Page 5 of 6

Prepared by 0 **for the** 0 **Timber Sale on** ____ **Date**

Listing of C5.42 Roads for Collection Deposits - Maintenance Level 3 thru 5

Road Number	Termini From	Termini To	Length	MBF Volume	MBF Miles	Surface Type
						☐ Asphalt ☐ Crushed Agg ☐ GR,PR, Native
						☐ Asphalt ☐ Crushed Agg ☐ GR,PR, Native
						☐ Asphalt ☐ Crushed Agg ☐ GR,PR, Native
						☐ Asphalt ☐ Crushed Agg ☐ GR,PR, Native
						☐ Asphalt ☐ Crushed Agg ☐ GR,PR, Native
						☐ Asphalt ☐ Crushed Agg ☐ GR,PR, Native
						☐ Asphalt ☐ Crushed Agg ☐ GR,PR, Native
						☐ Asphalt ☐ Crushed Agg ☐ GR,PR, Native
						☐ Asphalt ☐ Crushed Agg ☐ GR,PR, Native
				Total MBF/Miles	0	

Asphalt		Collection		CWFS		Asphalt
0	x		x		=	$ -
Total MBF Miles		Rate		Rate		Total

Crushed Aggregate		Collection		CWFS		Crushed Aggregate
0	x		x		=	$ -
Total MBF Miles		Rate		Rate		Total

GR, PR or Native		Collection		CWFS		GR, PR or Native
0	x		x		=	$ -
Total MBF Miles		Rate		Rate		Total

EXHIBIT 5

C5.42 Total Deposits $ -

[To pg 1 of 6]

NOTES:

Maintenance Work Sheet

Prepared by [0] for the [0] Timber Sale on [ ] Date

Listing of C5.43 Roads - Allowance for Purchaser Performed - Closures

Road Number	Type of Closure	Qty	Unit $	Total $
	Earth Barrier		$ 110.00	$ -
	Earth Barrier		$ 110.00	$ -
	Earth Barrier		$ 110.00	$ -
	Earth Barrier		$ 110.00	$ -
	Earth Barrier		$ 110.00	$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -

$ -

Plus Overhead 15%
Plus Rofit & Risk 2%

C5.43 Allowance for Purchaser Performed $ -

[To pg 1 of 6]

Listing of C5.43 Roads for Collection Deposit

EXHIBIT 5

Total

Plus CWFS Rate 28.62%

C5.43 Total Deposits $ -

[To pg 1 of 6]

24X

The Bridge Brothers More-With-Less Solution

Tom Gillins
Regional Bridge Engineer
Regional Office, Region 4

The Bridge Brothers Enterprise is in its second year of operation. Earlier this year, a notice sent to their customers indicated that their available work time was rapidly filling and that requests for service—including an In-Service Authorization (6500–46)—had to be made quickly. A total of $58,750 in requests came in for bridge inspection services. Of that amount, $18,750 came from the Payette National Forest for the inspection of 75 bridges.

At the time, there were only six qualified inspectors in the Region, and they were trying to qualify a cadre of bridge inspectors. Several other inspectors had just completed a training course, but had to gain some experience before they could be certified. This could be accomplished through participation in a mentoring program and performing work with an experienced inspector who would provide feedback and advice.

Adding these needs together—the Payette National Forest's need for bridge inspections and the bridge inspectors' need for mentoring—the following brainstorm resulted and was proposed as a win-win solution.

Payette Bridges Work Project team members (back row, from left) Tom Gillins, Kent Goldsberry, Wally Bunnell, Bill Keith, Lendon Gunter, Rich Fisher, Klein Houston; (front row) Patty Hackett, Sara Lau, and Ben Hipple.

Inspector takes to the water to look at a bridge during the Payette Bridges Work Project.

The Bridge Brothers would use the $18,750 of money set up to inspect the Payette bridges to put together teams of bridge inspectors for a week-long work project.

The Payette Bridges Work Project would meet in McCall, Idaho. Teams made up of one senior inspector and a newly trained inspector would be organized, and Regional direction and expectations would be outlined. Each team would be assigned 15 or so bridges. During the week, the teams would regroup to discuss results and to do load-rating analysis. The Bridge Brothers would be responsible for final preparation of the inspection report.

On September 9, the 10 qualified bridge inspectors converged on McCall, Idaho, and the Payette National Forest to participate in the Bridge Brothers solution. In one fell swoop, they accomplished 81 bridge inspections and a lot more. There were two inspectors on each team—one an experienced journeyman and the other one newly trained.

Each morning, the teams met to get the day's assignments and exchange information. Teams were reorganized daily to provide maximum exposure among Regional inspectors. The Bridge Brothers caught up with the inspection teams in the field to provide feedback and Regional direction.

The project was completed within budget, and the following goals set out during conception of the project were accomplished:

- Bridges inspected; programmed work accomplished.
- Experience for new inspectors.
- Technology transfer among inspectors.
- Commonality among inspections, forests, and the Region.
- On-the-job training.
- Time savings for the Bridge Brothers Enterprise team.
- Potential bridge inspection teams formulated for future marketing.
- More with less.
- Potential for applying similar concepts to other Government programs, such as site-plan surveying, mapmaking, and campground layout.

Participants included—

- Tom Gillins, RO, R–4
- Bill Keith, RO, R–4
- Rich Fisher, Humbolt-Toiyabe NF
- Ben Hipple, Payette NF
- Patty Hackett, Salmon/Challis NF
- Sara Lau, Salmon/Challis NF
- Lenden Gunter, Sawtooth NF
- Wally Bunnell, Targhee NF
- Klein Houston, Uinta NF
- Kent Goldsberry, Wasatch-Cache NF

Bibliography of Washington Office Engineering and Technology & Development Publications

This bibliography contains information on publications produced by the Washington Office Engineering Publications Section and the Technology & Development Centers located in Missoula, Montana, and San Dimas, California. Arranged by series, the list includes the title, author or source, document number, and date of publication.

This issue lists material published since our last bibliography (*Engineering Field Notes*, Volume 27, September–December 1995). Copies of *Engineering Field Notes*, *Technology & Development News*, and most Engineering Management Series documents are available to Forest Service personnel through the Engineering Staff Technical Information Center (TIC). Copies of *Tech Tips*, Project Reports, and Special and Other Reports can be obtained from the Technology & Development Center listed as the source.

Forest Service—USDA
Engineering Staff Technical Information Center
201 14th Street SW
Washington, DC 20250

Forest Service—USDA
San Dimas Technology & Development Center
444 E. Bonita Avenue
San Dimas, California 91773

Forest Service—USDA
Missoula Technology & Development Center
Fort Missoula, Bldg. 1
Missoula, Montana 59801

Engineering Field Notes (EFN)

This publication, which is published every 4 months, provides a forum for the exchange of information among Forest Service personnel. It contains the latest technical and administrative engineering information and ideas related to forestry.

EFN by Title

1995 *Engineering Field Notes* Article Awards	Editor. EFN 28 (January–April 1996): 1–4.
1995 *Engineering Field Notes* Article Award Winners	Editor. EFN 28 (September–December 1996): 1.
1996 Forest Service Engineers of the Year	Editor. EFN 28 (May–August 1996): 1–16.

EFN by Author

Johnston, John. EFN 28 (September–December 1996): 9–23.	Cost Estimators in Region 6 Join FORCES to Get the Job Done
Kilroy, Bill. EFN 28 (May–August 1996): 17–24.	Improved Autonomous Accuracy for Forest Service CPS Receivers
Lilienthal, Christina. EFN 28 (May–August 1996): 25–30.	The Wood River Project
Moll, Jeff; Lider, Ed; Harper, Robert; and Neirinckz, John. EFN 28 (January–April 1996): 23–33.	Full Recontouring and Channel Crossing Restoration Techniques for Closure and Obliteration of Low-Volume Roads
O'Brien, Stephen (Obie) and Brooks, Ervin J. EFN 28 (January–April 1996): 5–26.	A Course Filter Method for Determining the Economic Feasibility of Helicopter Yarding
Porter, Allan K. EFN 28 (May–August 1996): 31–36.	Bioremediation Using Land Treatment for Hydrocarbon-Contaminated Soils
Renison, Bill and Tillman, Kathleen. EFN 28 (May–August 1996): 37–46.	Bridges: Some Old, Some New; Some Needed, Some Not
Simila, Keith. EFN 28 (January–April 1996): 17–21.	How to Submit Proposals to the Technology & Development Centers' Engineering Technology Program
Sowa, Richard. EFN 28 (September–December 1996): 3–7.	A History of the Forest Highway Program
Varner, Vicky; Maus, Paul; and Lachowski, Henry. EFN 28 (May–August 1996): 47–51.	Integration of Remote Sensing Into Resource Data Collection: Working With Imagery in ARC/INFO

Technology & Development News

Technology & Development News contains information on specific projects, ideas, and technologies being developed by the Technology & Development Centers to help solve many resource management problems.

Title	***Issue***
Aviation *Tech Tips* Issued	January–February 1996
Bear Resistant Containers	May–June 1996
Campground Recycling Publication	March–April 1996
Cruiser's Gear Carrying System	July–August 1996
Documents Published Since August 1995	May–June 1996
(The) Effects of Wildlands Fire Smoke on Firefighting Personnel	January–February 1996
Fireline Explosives and Hazardous Tree Blasting	July–August 1996

Fire Management Publication Issued	January–February 1996
Forester C–2000 Mobile Rock Crusher Demonstration Project	September–October 1996
GPS Aircraft Guidance Systems Evaluation/Demonstration	November–December 1995
Geosynthetics for Trails in Wet Areas	November–December 1995
Investigating Wildland Fire Entrapments	January–February 1996
Latest PPS GPS Receiver Buy Completed	May–June 1996
Managing Recreation Surveys Using LASERSOFT	May–June 1996
MTDC Can Now Key Military Type Global Positioning System Receivers	January–February 1996
New Bear-Proof Food Locker Design	September–October 1996
New Smokejumper Parachute Canopy	November–December 1995
New Timber Document	March–April 1996
New Training Video	May–June 1996
Nylon Strapping of Log Loads	March–April 1996
Pinch-Twist Conveyor Developed	March–April 1996
Recent Documents	March–April 1996
Recent Drawings	March–April 1996
Recent SDTDC Publications	July–August 1996
Recent Videos	March–April 1996
Recreation Publications Issued	January–February 1996
T&D Library on CD–ROM	July–August 1996
Trail Maintenance	January–February 1996
Tree-Marking Paint Gun Questionnaire	November–December 1995
Tree Marking Project	January–February 1996
Two CD–ROM's Under Development	November–December 1995
Variable Tire Pressure Computer Program (VTP 1.00) Issued	January–February 1996

Engineering Management Series and Other Publications

The Engineering Management (EM) Series contains publications serving a purpose or reader and publications involving several disciplines that are applied to a specific problem.

Title	Number
Bridges Self-Study Training Course—Construction Certification Program (Revised August 1996)	EM 7115–508–100
Cartographic Feature Files: A Synopsis for the User (Revised September 1996)	EM 7140–21
Earth and Aggregate Surfacing Design Guide	EM 7170–16
Forest Service Guide to CERCLA (Revised March 1996)	EM 2160–1
FS Specifications for the Construction of Roads and Bridges (Revised August 1996)	EM 7700–100
Guidelines for the Use of Digital Imagery for Vegetation Mapping (Slightly revised July 1996)	EM 7140–25
Remote Sensing Applications Center (August 1996)	EM 7140–26
Roads Self-Study Training Course—Construction Certification Program (Revised August 1996)	EM 7115–501–100
Standard Specifications for Construction and Maintenance of Trails (August 1996)	EM 7720–103
Trails Self-Study Training Course—Construction Certification Program (Revised August 1996)	EM 7115–506–100
Water and Wastewater Systems Self-Study Training Course, Part 1—Construction Certification Program (Revised August 1996)	EM 7115–511–100

Tech Tips

Tech Tips are brief descriptions of new equipment, techniques, materials, or operating procedures.

Title	*Source*	*Number*	*Date*
Bear-Proof Food Lockers	SDTDC	9523–1310	10/95
Differential GPS Aircraft Navigation, Resource Inventory, and Positioning Demonstration: Missoula, Montana, October 1995	MTDC	9634–2324	05/96

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VTP 1.00 Computer Program	SDTDC	9571–1311	11/95
Wye Valves Left Mounted During Transport	SDTDC	9651–1304	04/96

Project Reports

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