United States
Department of
Agriculture

Forest Service

Engineering Staff

Washington, DC

Engineering Field Notes

Engineering Technical Information System

Volume 24
January-February
March-April 1992

1991 Engineering Field Notes Article Awards

It is that time of year again. Time for you, "Engineering Field Notes" reader, to tell us which 1991 articles you feel were most informative, beneficial, and interesting; which articles helped your office save money; and which articles helped you develop more effective ways of getting your work accomplished.

Once you have chosen 1991's top three articles, please complete the rating sheet on the following page. Rate only three articles. Rate them from 1 (best) to 2 (second best) to 3 (third best). And if you feel that an article has helped or will help the Forest Service save money or other resources, please let us know.

After you have voted, cut out the page (as indicated), fold and staple it closed, and mail it to the Washington Office. For your selection to be counted, your rating sheets must be delivered to the Washington Office by April 15, 1992.

Awards will be given to the authors of the three articles receiving the most favorable response from the readers. So remember, your vote counts!
We would like to thank everyone who contributed an article in 1991. As a result of each article, information and experiences were shared at all levels and in all Regions.

We would also like to take this opportunity to encourage you to start thinking of an "Engineering Field Notes" article for 1992. Do you have information and experiences that could be beneficial to others in the field? Let's make an effort to save more time and money in 1992. And what better way than with an article that will be distributed Service-wide.

1991 Engineering Field Notes Awards

Article	Author	Choice (1, 2, 3)	$ Saved
January/February			
Where Is First & How Far Is Second-GPS	Douglas Luepke	____	____
Fire Mapping Using Airborne Global Positioning	Phil Drake	____	____
Precautions for the Removal of Vinyl Asbestos Floor Tile	Joe Meadows	____	____
May/June			
Road Obliteration	Sterling J. Wilcox	____	____
Roadway Surface-Water Deflectors	Curt Rosman	____	____
Why Weight, Rate, & Calculate Decision making Is Unsound-A Challenge to the "Rational Method"	Lee Collett	____	____
Chainlink Retaining Walls-Alternative Facings & Forming Can Save Money	Don Porior	____	____
Bradford Quarry Volume Determination	Greg Visconty	____	____
Using Autolisp To Compute Design Quantities in AutoCAD Drawings	Tom Strassmaier	____	____
Possible Problems With Chip Sealing Over an Aggregate Surface	Shephan D. Johnson and Ron Andrus	____	____
Trail Hardening Test	Daryl L. Gusey	____	____
Is Optical Storage in Our Future?	Dale Petersen	____	____
The Making of a CD-ROM	Steven W. Oxman	____	____
July/August			
Impoundment Control Structure Design for the Mechanical Removal of Beaver Dams & Debris	Glen R. Andersen	____	____
The New & Unique Fall Lake Dam	Roger Pekuri and Ron Haakensen	____	____
The South Branch of Kinzua Creek Bridge	Jerry J. Hinz	____	____
The Hobo Engineer Revisited	Clifford Miller	____	____
Sixmile Bridge: A Component Structure	Don Porior	____	____
September/October			
Pump Flow Testing	Dan W. McKenzie	____	____
Inching Our Way to Metrics	Debbie Duperon	____	____
Mexico/USDA Forest Service Road and Bridge Design Workshop	Jose M. Martinez, Richard 0. Solheim, Charlton S. Lewis, Harold L. Valdez, and Duane D. Yager		
Field Testing of Roto Trimmer Mobile Rock Crusher	Skip Hegman and Kathleen Kreyns	____	____
Using GPS in Fire Fighting on the Shorts Fire (Okefenokee Swamp Fire)	Douglas Luepke	____	____
Getting There and Back—Program Strategy	Jerry Bowser and John Quenoy	____	____
November/December			
FastTrack Mapping at tho Geometronics Service Center: A Study in Continuous Quality Improvement	Gloria A. Miller	____	____
Raster Scanning and Plotting at GSC	Robert Nutter	____	____

TEAR ALONG THIS LINE →

COMMENTS: _____

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Name _____

(OPTIONAL)

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TEAR ALONG THIS LINE →

ENGINEERS: TURNING IDEAS INTO REALITY

Fascinating Facts About Engineering and National Engineers' Week

Our world would be a different place without the work of engineers, but, unfortunately, this country simply isn't producing enough of them. We couldn't drive across a bridge, travel long distances by plane or Space Shuttle, drink a glass of clear water, or stay warm in winter. We would read by candlelight, calculate with fingers and toes, and talk long distance by shouting.

The list goes on .....Everywhere we look, engineers touch us. Engineers safeguard our health, protect our natural resources, and improve our quality of life.

However, the National Science Foundation estimates that by the year 2000 America's demand for engineers to design the twenty-first century will outstrip the supply by 150,000! The combination of lower birth rates plus a sharp decline in the number of students pursuing mathematics and science is beginning to create a shortage of engineers at the very time demand for technical solutions to environmental and other challenges is growing.

Young Americans who are interested in helping our country recapture our national competitive edge and in cleaning up and protecting the environment must be encouraged to consider careers in engineering. Citizens and parents have to support technical/scientific courses in schools and engineers must promote their fields, especially among middle schoolers.

- The top ten engineering achievements of the past 25 years, according to the National Academy of Engineering: moon landings, application satellites, microprocessors, computer-aided design and manufacturing, CAT scans, advanced composite materials, jumbo jets, lasers, fiber-optic communication, and genetically engineered products.

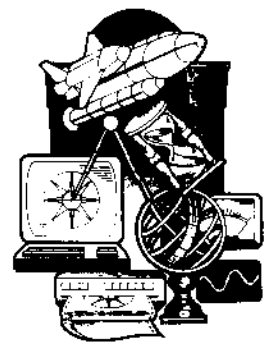
- Industrial robots first appeared in U.S. factories in 1961. Some 35,000 robots are in use now. The day is not far off when brain surgeons will rely on robotic helpers to position and focus surgical instruments, says the American Society of Mechanical Engineers.

- Within a few years, dentists will be able to scan a patient's tooth with a laser, then have a computer automatically design and manufacture a replacement crown while the patient waits. The first laser was produced by Theodore Maiman in 1960. But the concept of the laser was proven to be theoretically feasible by Albert Einstein in 1917.

- According to a National Engineers Week Committee Survey on Life in the Twenty-Second Century, artificial body parts will become "off-the-shelf" items to be purchased. We will inhabit the moon and artificial planets, but not Mars or any other planet. We will still have no control over the earth's weather and our most critical environmental problems will be hazardous waste disposal, lack of natural resources, clean air, and water shortages. New communications techniques will most likely make newspapers obsolete.

- National Engineers Week-always celebrated around George Washington's Birthday-was established by the National Society of Professional Engineers in 1951. Our first president was a military and agricultural engineer and land surveyor. He founded the first U.S. engineering school at Valley Forge, Pennsylvania, which later became the U.S. Military Academy at West Point, New York.

ENGINEERS HAVE CONSTRUCTIVE IDEAS!



WE SALUTE ALL MEN AND WOMEN IN THIS FINE PROFESSION EVERYWHERE.

NATIONAL ENGINEERS' WEEK

FEBRUARY 16-22, 1992

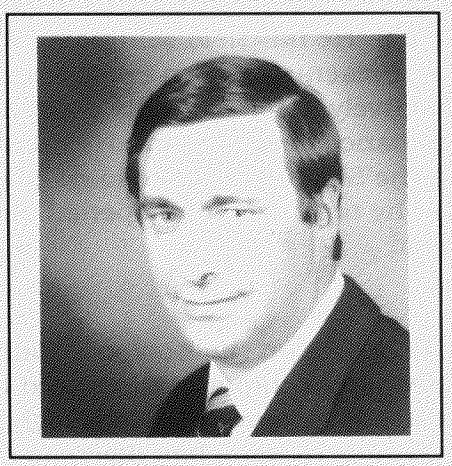
1991 FOREST SERVICE ENGINEERS OF THE YEAR

Congratulations to our three 1991 winners pictured below with a brief summary of their individual accomplishments. In recognition of their achievements, Sterling Wilcox, Director of Engineering, presented each a plaque and a $2,500 cash award in the Washington Office on February 19.

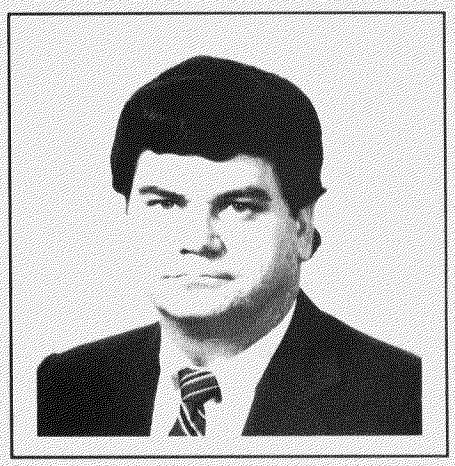
These outstanding individuals were selected from an excellent list of nominees from the National Forest System and Research. Judges included a Regional Engineer, a Forest Engineer, and a representative from Research. The selection was tough! Other finalists included:

Technician	**Management**	**Technical**
Wayne Wright, R1	Ken Tompkins, R2	Stephen Monlux, R1
John Barber, R2	John Fehr, R3	Tom Cassell, R3
Milton Taylor, R4	Larry Gorringe, R4	Dave Woras, R4
Willie Berg, R5	Ed Shea, R5	Sonja Bergdahl, R5
Portia Harris, R6	John Tucker, R6	John Dabritz, R6
Jack Oien, R10	Harold Gilpin, R8	Douglas Scholen, R8
Earl Geske, FPL	Russ Moody, FPL	Bruce Brunette, R10
		Dennis Gunderson, FPL

Gary Carlson, National Forests in Florida, R8, "Technician"



Frank Votapka, Kootenai National Forest, R1, "Management"



Bryce Stokes, Southern Forest Experiment Station "Technical"

Gary Carlson

As Ocala Zone Engineer for the National Forests in Florida in R8, Gary serves as one of the few Engineering Technicians to hold such a position. As a Registered Land Surveyor and Certified Civil Engineering Technician (NICET), Gary complements his leadership skill with broad technical experience and knowledge in accomplishing the Zone engineering and landline programs. His continued quality contributions are reflected in the respect he has earned from peers, Staff Officers, and Rangers and were recognized in a 1991 Sustained Superior Performance Award.

Gary's experience with clay stabilization of aggregate led to the use of limerock mixed with sand/clay for road surfacing, which has increased surfacing life and reduced maintenance costs of Florida forest roads. He is also working with the Regional Geotechnical Engineer to evaluate new chemical stabilization methods. Gary's development and use of the "Florida Dip" has reduced road construction costs while providing an environmentally sound solution to drainage problems.

For the five years that he was responsible for planning, scheduling, and coordinating the road design program for the three National Forests in Florida, Gary smoothly accommodated program and environmental process changes, accomplished work on time, and satisfied District Rangers' targets. Simultaneously, he handled additional projects, e.g., work force studies, training for the Engineering Construction Certification Program, and training in the use of computers. Through his own initiative, Gary has developed outstanding computer skills, providing Regional as well as Forest leadership in implementation and training for programs, such as Autocad, PLUS-III, Lumberjack, and Tonto-CAD. He is Staff Information Manager on the DG system, Contract Information Management Systems Coordinator, and Engineering Systems Manager for PC's on the Forest.

Gary contributes extensively to community activities. For seven years while in Region 9, he provided liaison between the Forest Service and Stout State University in Wisconsin and assisted teaching surveying and mapping. He has held seminars for County Commissioners and made other presentations on energy conservation and surveying. Gary has been actively involved in his church as a teacher, board member, and maintenance chairperson. He initiated and organized an agreement with the Shriners to take local disadvantaged children to the circus, and he organized and opened his home to a church teenage youth group.

Frank Votapka

As Forest Engineer on the Kootenai National Forest in Region 1, Frank has provided leadership and motivated his staff to routinely achieve their large assigned workload with high quality outputs. While managing engineering FTE's, he has diversified his organization and provided continued training and education for his staff. Through his leadership, the Forest Supervisor, Rangers, and Staff Officers view the Engineering staff as a service-oriented organization cooperating across functional lines. Forest staffs regularly request Frank's broad Forest

perspective, assistance, and participation on teams, from studying District consolidation to the Forest Budget Committee.

Through building partnerships and providing project coordination with State, county, and local officials, Frank is a leader in accomplishing Forest Goals. For example, construction of State Route 2 involved archeological sites, sensitive species, private landowners, and commercial, State, and county concerns. Similarly, construction of a pedestrian bridge across Burlington Northern railroad tracks for access to the scenic Kootenai River Falls involved State and county lands, a Lions Club park, the Railroad, the Kootenai-Salish Tribe and, of course, the many functional groups within the Forest Service. Beyond just accomplishing these projects while building public relations, Frank's leadership and contribution applies across all work, be it removal of underground storage tanks; radon mitigation; asbestos identification; cooperation with the BLM, FHWA, and COE; leadership in GPS and GIS; constructing a timber bridge under the Timber Bridge Initiative or a wildlife viewing area; providing access for persons with disabilities; working with the Noranda mineral development; or "routine" road and facilities construction, maintenance, and signing.

Additionally, Frank co-authored, with Calvin Baker, Fish Biologist, Report No. FHWA-FL-90-006, entitled "Fish Passage Through Culverts," a cooperative project between the Forest Service and the Federal Highway Administration. Frank also presented this topic at the 1991 5th International Conference on Low-Volume Roads. He also wrote "Use of Geotextiles in Forest Road Construction" as a member of a delegation to the People's Republic of China in 1985. Frank is a Registered Professional Engineer and has pursued continuing professional education. As an active member of ASCE for many years, he served on the membership committee and as Vice President and President of the Western Branch of the Montana Section. Frank is presently a member of the national ASCE committee, "Engineering Management at the Individual Level."

Frank has a Master rating in officiating football, girls and boys basketball, and girls softball and is a member of the National Association of Sports Officials. He has officiated at numerous State tournaments in both Montana and Idaho, including State championship games. He is actively involved in the Boy Scouts of America as a Merit Badge counselor, is a member of the Kootenai Falls Development Advisory Committee, and works as a volunteer on civic projects, such as improving trails for persons with disabilities and building picnic areas and outdoor toilets. Frank is routinely consulted by community leaders for input on Forest road and general engineering. He receives frequent requests to serve as keynote speaker at public meetings.

Bryce Stokes

As a Research Engineer at the Southern Forest Research Station, Bryce participates in developing engineering systems for intensive forest management. He has pioneered methods for assessing the operating characteristics, economics, and environmental interactions for harvesting equipment, promoting a holistic approach to under-

standing and quantifying the interactions between mechanical and biological systems. He is recognized as an expert in harvest equipment technology for thinning systems and flail delimbing/debarking operations. His methods are often cited and used by other researchers.

Bryce is particularly involved in transferring research results and providing technical assistance on environmentally sensitive harvesting. To this end, he is a member of a Region 8 New Perspectives task force, has spoken at forest landowner organization programs, and serves on the Alabama Forestry Commission Speaker's Bureau to promote good forest practices. He is active in the Society of American Foresters, vice-chairperson of the Forest Products Research Society, serves as Adjunct Associate Professor at Auburn University, and was recently appointed to the UN-FAO North American Forestry Commission Harvesting Committee. Additionally, he has served as lecturer on short courses for Alabama A&M University and the American Pulpwood Association. Having chaired American Society of Agricultural Engineers subcommittees, Bryce currently serves as secretary of the Forest Engineering Group and is Program Chairperson for the 1991 National Forest Engineering Conference. Bryce has authored or co-authored over 100 scientific and technical articles.

Bryce personally recruits and provides assistance in recruiting minorities and promoting forest engineering careers within the Research Unit through co-op education and trainee positions. He organizes technical training for subordinates, instills teamwork, and helps new professionals develop techniques for interacting with loggers, landowners, forest managers, and the public. He has held offices in the Civitan Club, Habitat for Humanity, and church-related organizations, and participated in planning and completing a number of community construction projects including building churches, building classrooms for Lee County Youth Services, building houses for Habitat, and rebuilding churches destroyed by fire. Bryce has organized and trained men of his church, led and directed work with young boys in a two-county area, and trained counselors for the program for boys.

The Real McCoy and Other Notable Accomplishments
DID YOU KNOW THAT . . .

Estevanico Dorantez (c. 1500-1539) one of four survivors of an expedition of 400 Spanish explorers, discovered Arizona?

Jean Baptiste Pointe du Sable (1745-1818), a New Orleans fur trader, founded Chicago?

Benjamin Banneker (1731-1806), mathematician and surveyor, created the first American-made clock?

Phillis Wheatly (1753-1784) so impressed George Washington with a poem she wrote about him that she was invited to meet him?

Norbert Rillieux (1806-1894) invented the vacuum-pan evaporator that produces refined granulated sugar?

Elijah McCoy (1843-1929) invented the drip cup, a key device in perfecting the lubrication system used in industry today? (So popular was his invention that inspectors generally asked whether a system employed "the real McCoy!")

Lewis H. Latimer (1848-1928) worked with Thomas Edison in inventing light bulb parts and drew the plans for Alexander Graham Bell's first telephone patent?

Matthew Henson (1866-1955) accompanied Robert Peary to the North Pole?

Garrett A. Morgan (1877-1963) invented the gas mask, an automatic traffic signal, and a hair straightener?

Frederick McKinley Jones (1893-1961) engineered the first truck refrigeration system?

Percy Lavon Julian (1899-1975) created physostigmine, a drug used to treat glaucoma, as well as cortisone and synthetic progesterone?

Charles Richard Drew (1904-1950) invented a method of preserving plasma for blood transfusions?

Lorraine Hansberry (1930-1965); a Broadway playwright at the age of 26, became the youngest winner ot the New York Drama Critics Circle Award for Best play "A Raisin in the Sun"?

Wilma Rudolph (1940-) became the first American woman to earn three Olympic gold medals in track?

Guion Steward Bluford Jr., (1942-), a Ph.D. in aerospace engineering, crewed aboard several Space Shuttle flights?

What did these accomplished individuals, who helped to shape the destiny of America, have in common? Their African American heritage.

FEBRUARY: BLACK HISTORY MONTH

March: National Women's History Month

Notable Firsts for America's Women
DID YOU KNOW THAT?. . .

Elizabeth Blackwell (1821-1910), the *first* woman physician in the United States, founded a hospital for New York's destitute women and children.

Lucy Hobbs Taylor (1832-1910) was the *first* woman to earn a degree in dentistry. She practiced in Lawrence, Kansas, for 43 years.

Margaret Knight (1838-1914) invented and patented a machine for making square-bottomed paper bags. Among her many mechanical inventions was a contribution to the sleeve-valve engine.

Ellen Richards (1842-1911) created the field of home economics as a way to improve family living through scientific and technical knowledge.

Annie Jump Cannon (1863-1941) charted 350,000 stars, more than any other astronomer to date.

Elizabeth Cochrane Seaman (pseud. Nelly Blye) (1867-1922) became America's *first* woman journalist, because of her rebuttal to an article in the PITTSBURGH DISPATCH that advocated restricting women to housework and family.

Alice Hamilton (1869-1970), a physician and advocate of work safety measures, was the *first* woman named to the Harvard University medical school faculty.

Nellie Tayloe Ross (1880-1977), became governor of Wyoming in 1925 and the *first* woman governor elected in America. She later served as the *first* woman director of the U.S. Mint, 1933-1953.

Gerty Theresa Cori (1896-1957) was the *first* American woman to receive the Nobel Prize. She shared it with her husband, Carl, in the field of medicine and physiology in 1947.

Gladys Emerson (1903 -), biochemist and nutritionist, was the *first* to isolate vitamin E from wheat-germ oil so that the vitamin could be synthesized.

Gretchen Fraser (1919 -) was America's *first* gold medalist in skiing—at the 1948 Winter Olympics in St. Moritz.

Janet Gray Hayes (1926 -) was the *first* woman elected mayor of a city of half a million or more in population—San Jose, California, 1974.

Sylvia Earle Mead (1935 -), marine biologist, became the *first* woman mission leader of a Tektite II project to explore beneath the seas for an extended period of time.

Kathy Kushner (1940 -) was the *first* woman in the U.S. to receive a jockey's license—in 1968.

Kathryn Sullivan (1951 -), oceanographer, geologist, and astronaut, became the *first* American woman to walk in space—while part of the October 1984 Space Shuttle mission.

Laser Tree Measurement

Tony Jasumback
Project Leader
Missoula Technology Development Center

Bill Carr
Timber Measurement Specialist
Region 1

This article appeared in *Timber Tech Tips, 9124 2336-MTDC*, September 1991.

A laser tree measuring instrument that can measure tree height almost instantaneously was evaluated in the fall of 1991 in Service-wide field tests. Preliminary evaluations of the laser instrument have been highly successful in both laboratory and field tests. The tree measurement device is the culmination of years of work to provide timber cruisers with an efficient, reliable, cost-effective electronic means for measuring standing trees.

Timber cruising is labor-intensive and arduous work, especially when working on steep, brushy terrain. Currently, measuring tree height requires the timber cruiser to measure the horizontal distance to the tree and then use an optical instrument to measure tree height. As the emphasis toward selling timber based on field volume determination has increased, more accurate measurements have become essential. As a result, tree measurement is becoming increasingly important to the Forest Service.

Forest Service personnel who have purchased laser instruments met in Denver in July to receive final training on operating the laser. Delivery of 17 prototype instruments was planned for early Fall. After the field test period, the same group met again with the manufacturer to discuss results and recommend final modifications. Plans are for the laser to be commercially available early in 1992. Cost will be approximately $5,000.

Project History

In the mid 1970's, laser distance measuring devices were developed to fill a number of military and industrial needs. These were relatively large, heavy semi-portable devices that were not suitable for resource management field operations. Forest Service personnel, however, believed there were possible applications to Forest Service tasks. The Missoula Technology and Development Center (MTDC) contracted with the China Lake Naval Weapons Center in China Lake, California, to determine the feasibility of handheld lasers for measuring standing trees. The state-of-the-art technology was too expensive and cumbersome to meet Forest Service needs.

In the mid 1980's, MTDC conducted a Service-wide survey to identify equipment needs for Timber Management personnel. As a result of the high priority placed on the need for improved tree measurement, a contract was awarded to the University of Arkansas Scientific Measurement Laboratory in Little Rock for a laboratory model tree measuring device to determine the feasibility of current laser technology. Soon after, a Denver-based company contacted the Forest Service to demonstrate equipment they believed was applicable to Forest Service tasks.

By January 1990, Laser Technology, Inc. had produced a prototype capable of both measuring the distance between the operator and a target and calculating vertical heights. Preliminary testing proved promising. Bill Carr, Northern Region Measurement Specialist, secured funds for a contract with Laser Technology to produce a prototype for Forest Service field testing.

The Laser Technology prototype is a substantially modified radar speed gun used by highway patrols.

In addition to a laser ranging device, the Laser Technology prototype contains a fluxgate electronic compass for determining azimuth, and an electronic vertical encoder to determine the vertical angle between the instrument and the target for determining tree height. In addition, the prototype has a numeric keypad for entering information and an LCD readout display.

Each of the components has undergone preliminary evaluation. By Fall 1991, 17 field prototypes were delivered to Forest Service personnel by Laser Technology. The instrument will undergo in-depth field evaluation to determine its capabilities and limitations. In addition, precise software requirements for the instrument and for post processing tasks will be established.

The Forest Service Division of Engineering is also interested in the potential of the laser device for second and third order surveying and Recreation personnel have expressed an interest in the possibility of using the laser instrument for site layout.

In early 1991, the Forest Service assembled a guidance group to:

(1) Coordinate and oversee the field test of the prototype units.

(2) Provide the expertise in a broad range of fields to evaluate the system's capabilities.

(3) To use information derived from the field testing to conceptualize and design future refinements to the instrument.

(4) And to function as a liaison between the resource management users of the instrument and the manufacturer.

Membership is:

Bill Carr	Region 1, Chairperson
Bay Walker	Timber R-2
Chris Roemer	Timber R-6
Frank Damaskos	Engineering, R1
Bill McLain	Forest Survey
Tom Costello	Natural Resources Specialist, OAMER, BLM
Tony Jasumback	MTDC

The Concept

Light is a form of electromagnetic radiation like radio and microwaves. The difference is that light has a much higher frequency than either radio or microwaves. The light emitted by a laser is no different from light emitted by any other source, but a laser has a unique method of generating light.

The word "laser" is actually an acronym that stands for light amplification by stimulated emission of radiation. In its simplest form, a laser is made by sandwiching a piece of active material, the lasing medium, between two mirrors. The two mirrors and the lasing medium form an optical resonator that allows the generation of laser light. The atoms of the lasing medium are put into an excited state by an external energy source. That is, they are made to store some of the energy. The atoms can be made to give up this stored energy as a light wave when another light wave interacts with the atoms. By making sure that the two mirrors are positioned exactly the right distance apart, the light that bounces back and forth forms a standing wave. Under these conditions, the light waves emitted by the atoms of the lasing medium combine to increase the strength of the standing wave. Just having the light going back and forth in the optical resonator is not particularly useful in itself. So, one of the mirrors is designed to allow a portion of the light to escape.

Lasers can be made from a great many different materials including solids, liquids, and gases. Also, the design of the optical resonator and the method of exciting the laser mediums can vary widely. But whatever form the laser takes, the light is generated by the same basic mechanism.

The type of laser used in this instrument is an infrared semiconductor laser diode. This laser diode has several properties that make it an ideal choice for working in the forest environment:

(1) The laser diode emits a narrow cone of radiation from a very small area. This allows the light to be colliminated into the very narrow beam for pin-point targeting.

(2) The laser diode switches on and off extremely quickly, typically in less than one billionth of a second. This provides the superior accuracy.

(3) Like all lasers, the laser diode emits only a narrow band of frequencies. This allows the detector to be "tuned" to the exact wavelength of the laser diode. This is why the instrument can operate during daytime when there is a lot of background radiation from the sun. (The instrument only "sees" the laser light. All other radiation is filtered out.)

Determining tree height.

Components

The current instrument is capable of determining tree heights and stem diameters within the specifications below:

Hand-Held Laser

It has an energy output that is approximately one-twentieth that of a typical television remote control. The unit can operate for extended periods of time on a battery pack. The instrument can rapidly make a large number of measurements, rapidly discard any readings which lie conspicuously outside the range of the others, and then almost instantaneously display a mean distance between the instrument and the target.

Specifications

The hand-held laser is eye-safe. Cost will be approximately $5,000. It is lightweight and portable.

Dimensions:	Approximately 3.5 inches x 6.5 inches x 8.5 inches
Weight:	Approximately 5.5 lbs.
Range:	To tree or other natural objects: 1,500 feet To reflective device: 30,000 feet
Accuracy:	Height measurements: +/-1 foot Diameter Measurements: +/- 2 inches Bearing: +/- 0.5 Degrees Distance: +/- 6 inches
Eye Safety:	FDS Class 1 (CFR 21)
Digital Display:	LCD 2 line x 16 character LED w/backlit
Battery:	Rechargeable-use; 8-1/2 hours of constant operation

Fluxgate Compass

The electronic compass integrated into the measuring instrument allows the operator to determine azimuth readings for surveying tasks. To increase accuracy, the mechanism is based on the earth's magnetic field rather than

on the magnetic pole. Although very sensitive, the compass is a well protected instrument and relatively rugged. The device operates with patented technology and is integrated with the software so that the magnetic declination can be preset so that all displayed readings are referenced to true north.

Sighting Scope

The scope consists of a modified 2X rifle telescopic sight mounted on top of the measuring instrument. It allows the operator to accurately aim the laser at the target even over distances of hundreds of feet. The scope also contains a graduated reticule. This allows the operator to enter information into the measuring instrument to calculate tree diameters. The device also features software which allows the operator to line up the scope with the center of the laser beam.

Keypad and LCD Display

A numeric keypad located at the back of the machine allows the operator to enter information into the instrument. In standard operation, the operator uses the keypad to choose the specific task, then the LCD display guides the operator through each activity necessary to complete the operation. In some cases, the operator needs only to aim the laser and pull the trigger. In others, he or she must read the target diameter from the sighting scope reticule and enter the number into the device. The software would then automatically use the entered data and the distance information to calculate the diameter of the tree. The LCD display features two lines at sixteen characters each, and is backlit for operation in difficult lighting situations.

Inclinometer

The inclinometer utilizes an electronic encoder to determine angles. The operator aims the scope at the top of the target and pulls the trigger. Next, the operator aims at the bottom of the target, and again pulls the trigger. The instrument prompts the operator to perform each of these functions, and then automatically calculates the angles between the measuring device and the top and bottom of the target to calculate its height, or to perform other tasks requiring similar data.

Software and Output Port

Under normal conditions, the instrument operator will turn on the instrument and use a series of directional keys to choose the task desired. The operator will then need to merely follow the prompts which appear on the screen. The software is rapidly evolving to both streamline the tasks which the system is already set up to perform and to provide the direction to perform new tasks as they are identified and isolated. A parallel port allows the output of information to standard Forest Service data collection and post-processing equipment. The feasibility of integrating the laser measuring instrument with other surveying equipment, such as the Global Positioning System, is also being investigated.

Safety Considerations

The construction of the laser measuring instrument was made possible by the development of an eyesafe laser design. The laser type chosen by Laser Technology Incorporated uses a pulsed gallium arsenide diode. The average energy output for the laser is only 70 microwatts. The laser is NIST certified. It also meets FDS Class 1 (CFT-21) eye safety standard, which requires an

output that will not damage the human eye under a minimum of 3 hours of continuous direct exposure. There are no other exposure related dangers associated with this type of laser.

How to Use the Laser

Tree Height (Total or Merchantable)

Determine the horizontal distance to the tree by aiming the instrument at any clear area of the tree.

When the instrument trigger is pulled the laser range finder and vertical encoder interact to determine the horizontal distance to the tree. Next, aim the instrument at the base of the tree.

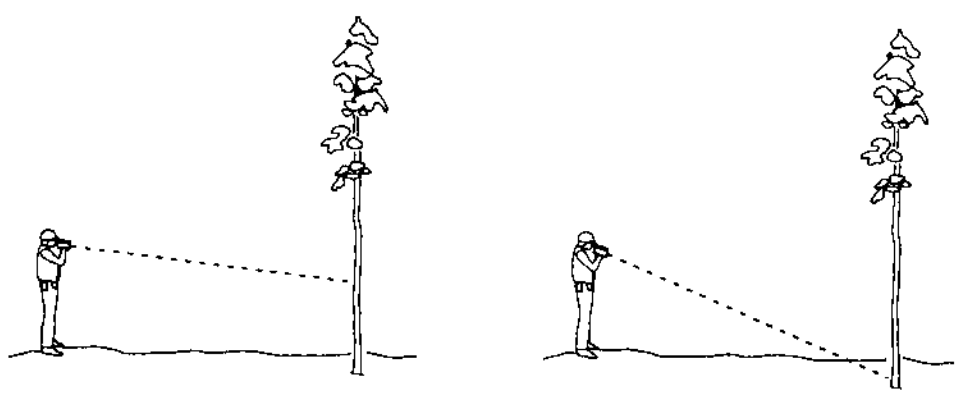
When the instrument trigger is pulled, the vertical encoder is used to determine the vertical angle to the base of the tree. Brush or other obstructions will have no effect on this reading since the laser portion of the instrument is not used in determining the angles.

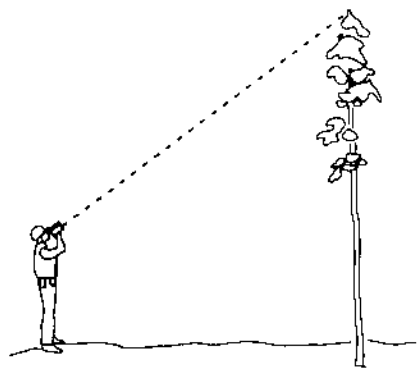
Next, aim the instrument to the top of the tree to get total height or at the point on the tree where merchantable height occurs to determine merchantable height.

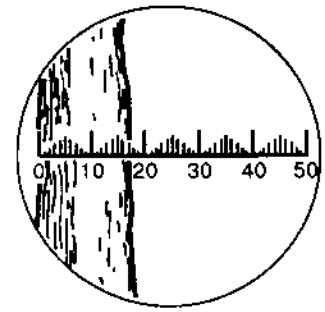
When the instrument trigger is pulled, the vertical encoder is used to determine the vertical angle to the top or merchantable height of the tree.

The person taking these measurements should be aware that this process assumes the tree is vertical. If the tree leans, all measurements should be made from a point that is at a right angle to the lean.

These steps will take approximately 10 seconds. The instrument will then process the data and within a second provide a display of the height measurement to the nearest tenth-foot.







In this example, the cruiser would read 17. This number is then entered in the instrument key pad. The height to that point to the nearest tenth-foot and the diameter to the nearest tenth-inch will then be displayed.

Tree Diameter

This instrument can be used to measure tree stem diameters at any point. The cruiser aims the instrument at an unobstructed area of the stem and pulls the trigger to determine the horizontal distance to the tree. Then, the cruiser aims at the base of the tree and pulls the trigger to get the degree slope to the base. The cruiser can then aim at the location on the tree where the diameter is to be determined and pull the trigger. The cruiser will then line the zero (0) graduation of the reticule, located in the scope of the instrument, on the left edge of the tree and read the scale where the right edge of the tree intercepts the scale.

Variable Point Cruising

When variable point cruising, the cruiser may use this instrument to determine if trees are "in" or "out" of the plot. Any basal area factor may be used to a maximum of 90 BAF.

Another function this instrument provides is to determine if "questionable" borderline trees are "in" or "out" of the plot. This is determined by taping the DBH, entering it into the instrument and shooting the DBH from the plot center. The instrument will display whether the tree is "in" or "out."

Surveying

The laser instrument is capable of measuring distances up to 1,500 feet to natural objects such as trees, rocks, foliage, etc. or in excess of 30,000 feet to a reflective prism. A filter may be attached to the receiver lens that, when used in conjunction with a reflective target, makes it highly unlikely that the instrument will get a reading on anything other than the intended target. When the filter is used, the maximum range is 500 to 600 feet, depending on the reflective quality of the target.

This instrument provides the option of being used as a hand-held total station surveying instrument.

- The laser range finder is used to measure slope distance.
- The vertical angle encoder is used to measure the degree of slope for computing horizontal distance.

- The fluxgate compass is used to measure horizontal angles (azimuth).

These functions allow the instrument to provide, with a single trigger pull, horizontal distance, slope distance, degree slope, percent slope, and azimuth.

Another option, when in the survey mode, is to input the coordinate location (x,y,z) of the instrument and determine the coordinates of a remote target.

The third option, in the survey mode, is used to survey the boundaries of cutting units, plantations, etc., or roads. The instrument is capable of storing foresights and backsights for up to five traverses consisting of up to 175 stations. A serial connector provides the capability to download this information for processing.

The survey capabilities of this instrument are numerous. Some of the tasks that may be done more efficiently, quickly, accurately, and with fewer workers than with conventional equipment are:

(1) Low to medium order road surveys.

(2) Road-grade staking.

(3) Traversing land units to determine perimeter distances and acreage.

(4) Location of land line monuments and quarter or section corners.

(5) Referencing landmarks (geographic features and structures) to benchmark and map locations.

(6) Locating predetermined points from given coordinates for cruise/inventory plots, soil sample locations, wildlife transacts, fence locations, trail locations, etc.

(7) Provide precise location of timber sale cutting unit boundaries, when traversed from a reference point, and spatially locating reserve trees within these units for detection and providing evidence in timber trespass cases.

(8) Determining precise ground location for aerial photo targets.

(9) Mapping ground provides for logging system layout.

Current Status

The field tests of this instrument were conducted during the fall of 1991. The purpose of the field tests is to evaluate its performance in conducting all of the functions described in this report and to generate ideas on what modifications would be useful in the production mode.

The guidance group will examine the data generated by the field tests, evaluate the feasibility and cost-effectiveness of suggested modifications, and establish the final criteria for the production model. The hand-held laser should be available for the 1992 field season.

If you have questions on the handheld tree measurement device or would like to participate in the tests, contact: Bill Carr, Northern Region Timber Measurement Specialist, P.O. Box 7669, Missoula, MT 59807 or Tony Jasumback, Project Engineer, MTDC, Fort Missoula Bldg. 1, Missoula, MT 59801.

For additional information contact: *Tony Jasumback, Project Leader, Missoula Technology & Development Center, Bldg 1, Fort Missoula, Missoula, MT 59801 Phone: 406-329-3922; FTS: 585-3922; FAX: 406-329-3719; DG-T. Jasumback:R01A.*

Portable Power Platform

Keith Windell
Project Leader
Missoula Technology and Development Center

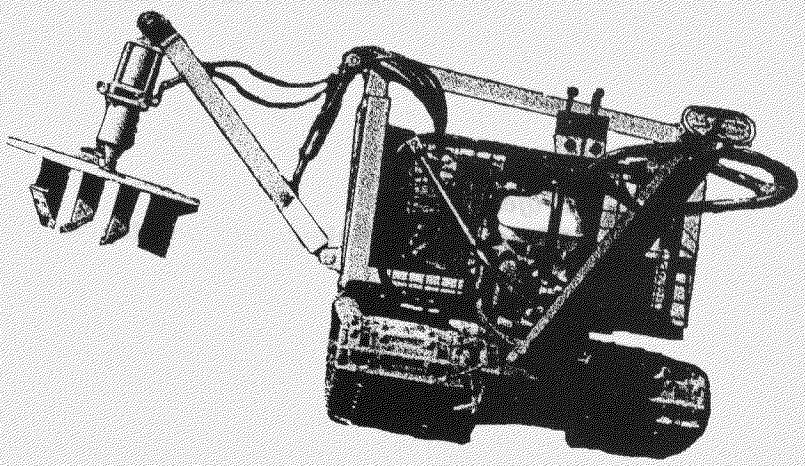
This article appeared in *Timber Tech Tips, 9224-2301-MTDC*, October 1991.

An off-road vehicle that both transports equipment and provides a lightweight power source for operating a variety of implements and hand-held tools has been assembled at Missoula Technology and Development Center (MTDC). The unit is currently being tested for its application to Reforestation programs. Recreation, Range, and Fire will also benefit. The vehicle selected as the prime mover for this project is the Iron Horse Caddy Tractor, manufactured by Electro Mekan of Arjang, Sweden. Electro Mekan is a subsidiary of Husqvarna. This unit was chosen after a market search by MTDC engineers. The JH125 Model Iron Horse is a tracked vehicle that weighs 878 lbs when an empty steel platform is attached and is powered by a four-stroke 5 hp Honda engine. The basic unit is rated to carry 1,102 lbs.

MTDC conducted an extensive evaluation of the Iron Horse that focused primarily on its load carrying and terrain capabilities and the safety aspects of its field operations. MTDC concurrently began the design, fabrication, and testing of numerous accessories for the Iron Horse. The platform proved to be safe and maneuverable. The fabricated power pack supplied more than enough power to operate hydraulic hand tools and an experimental rotating disc scarifier. The platform was used to accomplish such tasks as pruning, thinning, and chipping with mixed results.

A bulk load carrier for the platform was designed and field tested by a fire crew on the Lolo National Forest in FY 1990. They mounted a 72-gallon water blivet and pump on the carrier to help with mop-up activities. They reported the system to be very stable in the forest environment and to have a good potential for firefighting.

A multi-purpose hydraulic power pack was completed and also tested in FY 1990. This unit is powered by an 18 hp gasoline engine that drives a pressure compensated variable displacement hydraulic pump. The system has a 15-gallon hydraulic oil reservoir and two sets of quick disconnect outlets. These are controlled by manually actuated three-position detent valves. At 3,000 ft above sea level the power pack can put out 7.5 gallons per minute at 2,000 pounds per square inch.



Hydraulic power pack with experimental scarifier.

Bulkload carrier

A rotating disc scarifier was developed for use with the hydraulic power pack. The first design was limited to use on slopes of less than 15 percent. A second down-sized version with the ability to operate in steeper terrain is being developed.

A small brush chipper was mounted on the Iron Horse and tested in FY 1990. The unit tested can chip material up to 4 inches in diameter. This system with its ease of maneuverability offers a viable alternative to stacking and burning slash.

The platform is undergoing final field tests with the various accessories. Results will be evaluated and appropriate changes will be incorporated into the system. Some of the accessories used to show the utility of the portable power platform concept are already commercially available. The others are prototypes built by the MTDC shop. A progress report on preliminary test results is available from MTDC, *Portable Power Platform, 9124-2818-MTDC.*

For additional information contact: *Keith Windell, Project Leader, Missoula Technology & Development Center. Bldg. 1, Fort Missoula, Missoula, MT 59801 Phone: 406-329-3956; FTS: 585-3956; FAX: 406-329-3719; DG-K.Windell:R01A*

Functionalism, Professionalism, and the New Middle

John Lupis
Director, Engineering
Intermountain Region

The winds of change are blowing hard these days. We are constantly reacting to new initiatives, changing programs, and increased pressures in the Forest Service. Management philosophies and concepts are also changing. Total Quality Management (TQM), excellence, empowerment, and the new middle represent a few of the new management themes. One of the most visible reactions to our changing world is reorganization. Many Forest Service units are reorganizing to more effectively manage in this new environment. The primary objective in most of these reorganizations is to create a more integrated approach to our management and eliminate (or minimize) functionalism.

During the past several years, functionalism has become somewhat of a dirty word in the Forest Service. Unfortunately, it is also a word that is not commonly understood. What is functionalism anyway, and what's bad about it? Traditionally, our organizational structure in the Forest Service has been pointed along functional lines (that is, timber, range, wildlife, and so forth). This has allowed us to implement Congressional direction quite well as most of our funding, Congressional direction, and accomplishment targets have been along these functional lines. Our functional organizational structure has also served extremely well in the development of a strong, professional, and technically competent workforce.

The negative side of our functional organization in today's changing management environment is that our powerful staff structure has created a work culture that has a tendency to keep people in their organizational "boxes" and limits their thinking to their own functional area. Obviously, this is not acceptable. We must function in a more interdisciplinary fashion and be more responsive to agency mission and Congressional direction rather than protecting our functional turf.

So the next question to address is "Do we need to restructure our organization to break up our traditional and functional concepts and ensure a more integrated management approach?" Obviously some folks think so, as we see the emergence of new organizational concepts in a number of Forest Service units throughout the country. Typically, these new pilot organizations feature multi-functional staff responsibilities at the Forest level organization; more

team-oriented structures that contain a cross-section of people from many disciplines; and the elimination of traditional and functional staff positions in favor of broader, more generic staff responsibilities (for example, Administration, Information, Operations, Planning, Design and Analysis, and so forth). The danger of these organizational concepts is that over time they will seriously erode an important cornerstone of our foundation—our professionalism and technical competence. Whatever organizational structure we elect to implement, we need to maintain and protect the stability and continued growth of our technical competence and professionalism.

More specifically, let's consider some of the negative implications some of these new organizational concepts can have on our professionalism.

New Professionals

New professionals need to work closely with more senior professionals in their field of expertise to receive training and realize professional growth. This is true for all disciplines from Engineers to Wildlife Biologists to Foresters. Many of the new integrated organizational concepts thrust the new professional into a work situation where the new professional is working as an interdisciplinary team member with a mix of other professionals. Opportunities to interface with senior and peer professionals are thereby limited, if not impossible, blocking professional development and growth.

Journey Level

Along the same line, when does a professional graduate become a professional performer? Journey levels are clearly established for all professional series and are normally considered the professional level of performance. How effective can a new (below journey level) professional be on an interdisciplinary team? What skills does the new professional bring to the table? A new professional right out of school is simply not equipped to provide the level of professional advice and consultation to an interdisciplinary team that is often needed. Without adequate field experience, the recent graduate's point of reference is often too theoretical to result in efficient and practical "on the ground" applications. Interdisciplinary activities should be conducted with fully qualified journey level professionals for maximum efficiency, credibility, and quality. Some new organizational structures are forcing integrated team activities at too low a level to be effective or credible.

Professional Registration

Professional registration and certification are another clear measure of technical competence, and State registration requirements are becoming more common in a number of disciplines. Professional registration for our Engineering workforce, for example, has always been an important career goal and is becoming increasingly more important as many States are requiring that engineering design and construction administration be accomplished by a registered professional engineer on Federal projects within that State (where the State has primacy). While State requirements may differ somewhat, nearly all require Engineers-in-Training to work under the direct supervision of a registered professional Engineer for a specified period of time. Registration/certification in other disciplines obviously have similar apprenticeship requirements; therefore, having an organizational structure that allows for this work arrangement is obviously of paramount importance to our professional workforce. Most integrated concepts do not meet this requirement.

Multi-Staff Responsibilities

Multi-staff responsibilities can be another infringement on professionalism. Some staff combinations can work effectively, depending on the complexity and mix of the combined responsibilities on that particular unit. Too many times, however, the mix of responsibilities can overwhelm the individual and result in disappointing work. A good example is the Forest Staff Officer having responsibilities for all resources. Few, if any, individuals are equipped to provide functional leadership in all of the various resource areas, let alone having the time to do it. Some folks argue that these staff positions are management level jobs and in-depth knowledge of the various functional areas is not required. Good management skills are certainly important, but that individual must also have the necessary professional knowledge and experience in order to provide program leadership, technical oversight, and accurate staff advice to the Forest Supervisor and other members of the Forest leadership team.

Delegation of Authority

Another very significant problem with the multi-functional staff concept relates to delegation of authority. Here again this will depend on the actual mix of responsibilities, background, and skills of the incumbent, but in many cases, delegation of authority to that Forest which is based on the skill level of the Forest Staff Officer may be compromised.

Uniformity

Another valid concern expressed in the face of numerous hybrid organizational structures popping up across the Service is that of uniformity. How similar does our basic organizational structure need to be unit-to-unit? During the 1970's, the Forest Service experimented with a number of developmental organizational structures at Supervisor's Offices across the country, with varying degrees of success. One common observation, however, was that the lack of similarity to other Forest Service units created a number of problems. Obviously, not all units have to be identical, but in having a similar basic structure, a number of important objectives are maintained. For example, technology transfer and communication are much more effective; technical workshops have a clearer, more defined audience and duplication of training effort is minimized; and improved career ladder opportunities and ease of movement between Districts, Forests, and Regions are also facilitated. Organizations with uniquely different structures become an "island of difference" and personnel on these units find it difficult to fit into the mainstream of technology transfer, communications, and career development. Obviously, deterioration of our professionalism and technical competence will result over time.

Summary

Some organizational adjustments may be needed to meet the challenges of the 1990's. The question is, how much adjustment is necessary? Before we make dramatic changes in our basic organizational structure, we need to give careful thought to some of the important features we may be giving up in the process. Let's be especially careful to guard our professionalism and technical competence. We can embrace the new management concepts and philosophies of the 1990's without major overhaul of our basic organizational structure. The new middle, TQM, and excellence do not require a new organizational structure; they require a "new thinking," fresh attitudes, and a clear vision.

As a parting thought, let's remember the words of Petronius, a Roman poet and author written over 2000 years ago:

"We trained hard...but it seemed that every time we were beginning to form up into teams, we would be reorganized. I was to learn later in life that we tend to meet any new situation by reorganization, and a wonderful method it can be for creating the illusion of progress while producing confusion, inefficiency, and demoralization."

Petronius Arbiter

Being More Effective

John L. Zirkle
Civil Engineer
George Washington National Forest

Introduction

As Professional Engineers working on National Forests we need to think about what we do and how we do it. Are we utilizing our time, talent, and training as effectively as we could be? Are we providing the Districts and the public with the most bang for the bucks? As we are asked to do more with less, findings the answers to these questions becomes increasingly important.

What is our role as Forest Service Engineers?

Each of us plays a key position on an engineering team. Each one of us has responsibilities that fall into one of three areas:

(1) Supervision
(2) Program management
(3) Technical and professional

How we perform our duties in these areas will determine our overall effectiveness. If we fail to perform, or perform poorly, in any one of these areas, our effectiveness is diminished. Think of these three areas as legs supporting a stool—each leg must be equally strong to support the weight placed on it. If one leg is missing or weak then the stool will fail. Likewise, if we are neglecting duties in any of these areas, we may be experiencing problems that could be avoided. We also may be limiting our career development or creating performance problems.

On the other hand, if the performance of our duties is strong in all three areas, we'll be able to carry our share of the work more effectively. We'll also be preparing ourselves for that next level of responsibility. To be more effective we don't have to necessarily work harder—just smarter.

Developing into an Effective GS-11/12 Engineer

We all started our careers as trainees (GS-5/7). Most of us got started working closely with technicians. During those early years we learned the routine, technical aspects of our work. As GS-9's we started working more independently and usually under another Engineer. At this level we again were primarily developing our technical skills. We had little or no supervision responsibilities, and depending on our supervisors, little or no program management duties. Most of us were probably performing duties at the

engineering technician level—routine inspection and design work. Sure, we probably had a few higher level duties, but for the most part we served as another tech for a GS-11 Engineer. This GS-11 served as our role model for our next stage of development. If the GS-11 was a good model and supervisor, and we did our part, we were prepared to begin the next stage of our career.

As a GS-11/12 we became supervisors and program managers. We also started working more independently as planning, design, and construction engineers. Our education and prior experience as GS-5/9's prepared us for these higher level positions. At this level we got paid for our technical knowledge and skills, but equally important we got paid to perform supervisory and program management duties.

As we make the transition from the GS-9 to GS-11/12 level, it would be easy to simply keep working at the level at which we were accustomed. Don't fall in a trap and continue to simply perform the routine, technical level duties—supervise the performance of these duties by technicians (or in the case of inspection, by contractors). Yes, we all do some routine technician and clerical type work. However, some engineers do a much higher percentage than may be necessary. I've found that engineers who think and act like professionals develop techniques through their roles as supervisors and program managers to minimize the amount of time spent doing lower grade work.

We need to let the techs and contractors do their thing. As engineers, we have our hands full supervising and directing the work of others; completing higher level technical assignments; and managing a variety of engineering programs: road maintenance, facilities, OSHA, bridges, dams, geometronics, signs, cadastral, fleet, planning, PC systems, design and construction programs, and so forth. Each one of us is a professional engineer with supervisory and important program management responsibilities. We must understand and accept these responsibilities before we can assume our roles as fully effective engineers.

Let's take a closer look at our duties in each area. As we look these over, we can ask ourselves a key question—Could my effectiveness be improved? I think we might discover some opportunities for improvement. Under each area are listed some key points, comments, and questions for each of us to think about.

Supervision

I used to think that some people didn't need supervision--not true. Some folks may need more than others, but everybody needs, and is entitled to, supervision. A large part of our grade classification as GS-11/12's is based on these supervisory duties and for good reason. There's no way we can be totally effective unless we do a good job supervising and managing those with whom we work. Good communication and human relation skills will be crucial to our success in this area.

(1) How much time is spent supervising? This includes planning, encouraging, directing, monitoring, reviewing, appraising, and assisting the work of others. Depending on the number supervised, we could spend anywhere from 10 to 40 percent of our available time supervising.

(2) Supervision is like a sacred trust—how well we perform will largely shape the career development of another individual(s). If we do a poor job supervising we may retard development. We also need to provide a good example since we set the standards for those we supervise. Could we improve as role models? Do we:

(a) Have good work habits—get to work on time, dress appropriately, follow established policies, procedures, and so forth?

(b) Get our work done on time or have a reputation as a procrastinator?

(c) Have high quality standards or settle for mediocrity?

(d) Perform work primarily at our grade level or do we habitually do the work of those we are paid to lead?

(e) Reinforce other supervisors' roles by using the chain of command?

(f) Have an open mind to accepting change or do we promote negative attitudes by complaining or undermining new policies?

(g) Promote a positive team building attitude by looking for good in others rather than making negative, nonproductive comments?

h) Look for solutions to problems or just find problems?

(i) Maintain good working relationships with other employees?

(j) Accept full responsibility for our work and the work of those we supervise?

(3) Do we prepare project work plans and refer to the planning advice before making assignments? Do we make clear, written assignments with due dates? Do we monitor progress—providing additional guidance, encouragement, and direction as needed? Do we give our employees free rein to use their own initiative and creativity to solve the problem at hand? Do we make a conscious effort to acknowledge good work? Is the employee held accountable to get the job completed on time? Do we encourage employees to expand their skills by providing job enhancement opportunities: becoming PC-literate, details to other units, Construction Certified, PE/LS registered, an so on?

(4) When supervising other engineers, do we ensure that they are performing duties at their grade level to the extent possible? Do we delegate work to the appropriate level? Are employees meeting all their program management responsibilities? Are engineers encouraged to use available clerical and technicial assistance (S.O. & District) to fullest extent possible?

(5) Do we use the appropriate award system to recognize outstanding performance? Do we use the appraisal performance system as a tool to improve employee performance?

(6) Do we routinely review and critique the work of those we supervise?

(7) Do we emphasize that employees are ultimately and primarily responsible for obtaining needed training and in achieving developmental goals? Do we take an active role in assisting the employee in obtaining needed training? Do we avoid sending inappropriate signals on promotional opportunities that may create morale problems?

Program Management

Nearly all engineers in the Forest Service have important program management responsibilities. Program areas include the following:

(1) Planning and budget
(2) Facility planning and design
(3) Facility O&M
(4) Transportation planning
(5) Fleet
(6) Cadastral surveying
(7) Road maintenance
(8) Road design
(9) Federal Facility Compliance Program
(10) Forest Highway Program
(11) Engineering systems/CIMS coordination
(12) Dam Inspection Program
(13) Signs and Posters Program
(14) Bridge Inspection Program
(15) Contract administration/construction engineering
(16) Trails
(17) Water and sanitation system O&M and monitoring
(18) Traffic surveillance
(19) OSHA
(20) PC systems operations
(21) Geometronics

After looking at this list and seeing what has been heaped upon us, one can quickly see why we must be good planners, organizers, delegators, priority setters, administrators, managers, supervisors, jugglers, and so forth. This variety and complexity of work is largely responsible for determining our grade classification as GS-11's and GS-12's. Couple these program management responsibilities with our supervisory duties and the reason for the grade jump from GS-9 to GS-11/12 is obvious.

How we grow and develop in managing these program areas largely determines how successful we'll be in effectively meeting the needs of the Districts and public we serve. Developing program management skills also prepares us for higher level assignments—Forest Engineer, for example. Program management requires us to be innovative leaders unafraid of making decisions that shape Forest policy. We must be prepared to make things happen. If we do nothing, nothing will happen.

It's easy to ignore our responsibilities in this area since all of us can find plenty of project work to keep us busy. But how should we spend our valuable

time to most effectively meet the needs of the Forest? As professional Forest Service engineers that's a question we must answer for ourselves. The answer will vary since each of us has a different work load. Our supervisors are available to help us find a good balance in how to spend our time. The important thing is to realize we have program management responsibilities, vital to the well being of the Forest, that require a reasonable amount of our time.

Look at those program areas listed above and remember that our success or failure is a direct reflection of our individual and collective efforts in managing them. For example, if the Forest has a great geometronics program, then an engineer made it happen. Likewise, if the Forest has a poorly maintained transportation system, then we as engineers let it happen—How could we have better managed the program to have prevented the problem?

Look at that list again. For our areas of responsibilities, we should ask ourselves these questions:

(1) How could this program area be better managed to meet the needs of the District and ultimately the public? When is the last time I have given this question some thought?

(2) Do I actively participate in the work planning and budget process by providing needed input to manage and monitor my assigned program areas?

(3) Do I keep current on Manual and Handbook direction and policy requirements? Are existing Forest Manual Supplements current or do they need updating?

(4) Do I routinely visit the Districts to see what kind of problems they are experiencing—and then try to find solutions?

(5) Are there things that could be done to improve service to the public and/or reduce program costs? Are they being acted upon?

(6) Do I keep my supervisor informed on the status of my program areas? Do I check to see if my supervisor has any special concerns or ideas for work or changes in my program areas? As a supervisor do I provide needed direction to subordinates for specific work in a program area?

Time Management and Priority Setting

Our success at program management is directly proportional to the time we're willing to devote. We must ensure that we meet our minimum program management responsibilities.

Planning our time and setting priorities is a key to being successful. How do we spend our time? How much time do we spend doing things that could be delegated or maybe not done at all? How much time do we spend on the road? We can't get much done in a vehicle. Ask yourself: Is this trip really necessary? If it is necessary, do I really need someone else to go with me? Do I fully utilize available tech and clerical help? Do I have my work prioritized so I get done what's really crucial to this year's program of work? Do I control

and manage the work or do I let it run me ragged? Do I need help from my supervisor in planning, scheduling, and prioritizing my work? Do I complete my work late, creating unnecessary hardship for others? (Remember that those we supervise may have similar problems.)

How much time do we spend planning, organizing, and prioritizing our work? If we are spending little or no time in these activities, then something may be lacking.

Technical & Professional

Most of our technical work is performed by techs we supervise at both the S.O. and District levels. We plan, schedule, monitor, and control their activities. We get directly involved in doing the work when problems arise or when it's technically beyond the tech level of expertise. Of course, there are times when there is more tech work than there are techs, and at those times we all pitch in to get the job done. (Let's not forget that techs can be detailed from another unit to help when needed.)

As technical professionals, we set standards for the quality of work produced. We train and introduce others to new ways of doing work. We keep abreast of new engineering materials and technology. We interface with other Forest professionals in managing and implementing a variety of land management policies and activities. We maintain contacts with other Federal and State regulatory agencies.

When that first-time engineering design or problem comes along we're the ones who tackle it. We have the training and background to handle just about any engineering problem that may arise. When something is beyond our abilities, we know how to get assistance through our supervisors, R.O. specialists, or A&E firms. We not only identify problems—we solve them. We are not afraid to make decisions and do so routinely. We are the Forest experts for our assigned program management areas. As supervisors we provide the leadership that makes things happen. These attributes separate the GS-11/12 engineers from the GS-9's.

Professional Growth

What have we done since college to further our professional development? Have we considered taking additional college or vo-tech courses? When a unique design opportunity or an interesting detail comes along, do we take advantage of it? Have we been mobile to take advantage of new job or educational opportunities? What about considering an in-house job swap to gain new experiences? Are we taking advantage of the Certification Program to broaden our Forest engineering capabilities? Have we been working towards professional registration or ever considered joining a professional engineering society? Are we PC-literate or making plans to become so? Do we encourage others to increase their professional expertise?

As professional engineers we have interesting, challenging jobs. How we rise to meet those challenges will determine our effectiveness as individuals and as a group. Each one of us brings to the Forest Service a unique background. Each of us will handle our jobs differently based on our own set of experiences. The diversity in our approaches collectively makes for a strong

team solution. So, let's never forget to work together in resolving problems—let's grow and learn as a unit. But let's also remember, that each of us will determine our individual effectiveness: I decide how much I will develop—the opportunities are there. We can do little and function where we left off as GS-9's, or we can fully assume our roles as supervisors, program managers, and professionals. Only then will we be truly effective Forest Service Engineers.

Building Bridges

Lee Collett
Chief Transportation Planner
Washington Office

We have an opportunity to help change the emphasis of our educational system in the United States. Thanks to an invitation from the Technology Student Association (TSA), Sterling Wilcox, Director of Engineering, has accepted a position on the TSA National Advisory Council. Along with a number of high corporate officials and representatives from the Department of Education and NASA, the council will guide the rapidly expanding high school and middle school student organization to help America's youth meet the technology demands of the future.

Recently there was a gathering in the foyer of the third floor of the Auditors Building to formally introduce our involvement with TSA. Many engineering folks were there. Associate Deputy Chief Larry Henson was there. Executives from the Technology Student Associations were there. Other folks from the office stopped by. What was going on? A few of the engineering personnel had made balsa wood bridges and we were breaking them—just like in school—seeing who could make a model bridge that would hold the most weight.

The gathering on the third floor was in front of a display depicting the happenings of the Technology Student Association's National Conference, held in Tulsa, Oklahoma, last June. Pictures of high school and middle school age students—hundreds of them—building and breaking bridges. And, a write-up that briefly tells the story.

Building Bridges Our Partnership with TSA

The Technology Student Association (TSA) and the USDA Forest Service have entered into a participating agreement. This partnership encourages junior and senior high school students to focus on math and science in order to bridge the gap from high school to college engineering programs.

An exciting part of this partnership was the Forest Service's involvement in the TSA National Conference. Over 1,700 teenagers, from across the nation, met in Tulsa, Oklahoma, June 22-26, 1991, to compete in science and engineering projects. The Forest Service is a corporate sponsor of the bridge building competition. In this event, the students strive to build a bridge from balsa wood strips, to very constrained specifications. The bridges that meet this strict criteria are then subjected to load testing. The span that achieves the highest load rating (per weight of bridge) before collapsing is the winner.

Through this "Corporate Sponsorship," we are able to promote studies in math and science and provide a highly diversified and satisfying career choice in Forest Service "Outdoor Engineering."

The Story Behind the Story

Shortly after arriving in the Washington Office (August 1989) I received a booklet, an Interim Report of the congressionally mandated (Public Law 99-383) Task Force on Women, Minorities, and the Handicapped in Science and Technology, entitled, "Changing America: The New Face of Science and Engineering." The cover letter from the Department referring to the upcoming shortage of engineers and scientists stated: "The report findings and solutions bring to our attention the need to redirect our efforts to strengthening USDA's position for carrying out future mandates in science and technology." The report stresses a need for our involvement in the schools, grades K-12.

As I pondered ways that the Forest Service, and particularly engineering, could respond to the report, my thoughts went back to some experiences that I had had with my own boys and some of their school experiences. After a severe illness and missing eight weeks of school, one of my sons, along with his older brother, was scheduled to go to a State convention of the Technology Student Association at a city several hundred miles away. Not being sure of his state of health, I went along. I knew very little about TSA. About the only thing I had been involved in was helping to build their CO_2 powered cars that they would be racing.

I'm not sure who had the most fun at the convention, the students or me! There were competitive events in Aerospace, Architecture, Computer-Aided Design/Drafting, Construction Technology, Electronics, Extemporaneous Speech, Graphic Design, Manufacturing, a Technology Bowl, Problem Solving, and others. I ended up judging the Bridge Building and Tower Building competitions.

What impressed me the most, however, was not the events. It was the students: Students who were interested and involved in science and technology; students who were serious about their education; students who are tomorrow's architects, scientists, and engineers.

I didn't need an excuse to go to the TSA convention the next year. I was as excited to be there as my sons were. And, the Advisors don't mind putting anyone to work. Involvement is pretty easy once one puts one's foot in the door. I'm sure it was this positive experience that caused me to tie outreach recruitment efforts to the TSA organization.

After talking with the Director of Engineering about my ideas of how the Forest Service could be involved with student organizations to promote the awareness of science and engineering in the school systems, and getting a favorable response, I went to work to make it happen. My first contacts with the TSA National Office were very positive. I learned that TSA chapters exist in most States, with heavy participation in the South and East. That fit our emphasis in EEO/Affirmative Action. The Forest Service could become a Corporate Sponsor of a competitive event at the National Conference and also

have a booth there as well as sponsoring special events sessions. The opportunity was too good to pass up.

A participating agreement was developed with the TSA that made our involvement legitimate, with the final signing taking place in December 1990. By this time, I had also secured funding for the project. A considerable amount of preparation was necessary to pull off an effective showing at the National Convention, best explained by what took place there.

The TSA National Convention took place in Tulsa, Oklahoma, June 22-26, 1991. As the various chapters showed up from all over the United States, they found their way to the Hotels and to the Convention Center. In a very large convention hall, areas had been set aside for various activities and competitive events. As the advisors registered their groups, they were given a packet of materials for the conference. Not just an ordinary packet, however. The grey nylon briefcase with their materials in it had the TSA logo and the Forest Service shield stenciled on it with "Building Bridges" underneath the symbols. About 300 of these briefcases were provided for the conference. When the number of advisors exceeded the 300 expected, the briefcases became a very "hot" item at the conference.

TECHNOLOGY STUDENT ASSOCIATION

FOREST SERVICE
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DEPARTMENT OF AGRICULTURE

BUILDING BRIDGES

The first evening, a get aquainted "mixer" was held. The tradition of the conference prevailed as students from all across the United States traded State pins and other mementos. The Forest Service had its own display. Green campaign style buttons had been prepared for the occasion, with the same printing that was on the briefcases. Jack Arrowsmith (WO Eng), Pauline Cahill (R-8 Eng), and myself mingled with the 1,700 students and "traded" buttons for all sorts of pins, stickers, and other keepsakes. By the end of the evening nearly every student there was wearing a green button.

Sponsors were invited to set up booths to display their wares or messages. Our booth displayed a number of attractive pictures of Forest scenes and displayed the centennial banners. Bob Yoder (R-6 Eng) had coordinated the development of an engineering recruitment video, which we showed continuously at the booth. We had a number of posters that we passed out as well as some Smokey Bear memorabilia. Our main thrust at the booth was to introduce the students to the Forest Service and, in particular, to explain the career options in engineering. To do this we had the "Make a Difference" recruitment brochures with inserts we had prepared on Civil Engineers and Engineering Technicians. Kathy Burgers (WO P&CR) helped at the booth.

We held two special interest sessions. These were hour-long, auditorium-style presentations that I made to interested students and advisors. The theme was "Building Bridges" and discussion and videos where aimed at bridging the gap between high school and college and between college and a career.

Of course, the big event, the one we were there for, was the bridge building competition. In this event the students, in teams of two, get 20 lineal feet of 1/8-by-1/8-inch balsa wood strips, glue, and pins (to hold the pieces together while drying) to construct a bridge which they design and construct to a certain set of specifications. About 500 students participated in the event.

Because our involvement was premised around being the sponsor of the bridge building competition, we felt dedicated to doing all we could to make this event successful. In talking previously to the event coordinator, we determined that supplying a bridge load tester could be of great benefit. At previous conferences, bridges were tested by hooking a bucket to the bridge and pouring lead shot into the bucket until the bridge failed. With hundreds of bridges to test, it was a lot of work for the judges. We decided to help out by supplying a device to test the bridges. Missoula Technology and Development Center designed and constructed a first class bridge breaker. It was a real hit at the conference.

As we wound up the conference, we were riding high with excitement and satisfaction. We had talked with hundreds of students one-on-one about their schooling, about their futures, and about the possibility of a Forest Service engineering career. We had talked with State and school advisors excited about the Forest Service being involved in their programs. We had requests from all over the country to be able to use the bridge breaker at their State conferences.

Well, now with the conference over, what do we do about it? At a recent meeting, the Regional Engineering Recruitment Coordinators received the

information they need to followup with State TSA organizations. The States sponsor similar conferences that we could be involved with. Local engineering units could work with individual schools. If TSA is not organized or chartered in your state, you may be able to work with the school system and TSA to introduce it.

Georgia and Iowa have already lined up the "Bridge Breaker" for their State Conferences and, of course, Forest Service Engineers will be there to help out. With involvement at the National level and support from the Regions and Forests, we really could provide for a pipeline of future engineers and engineering technicians and make the Forest Service an "employer of choice."

Technology Student Association Advisory Council

As we face the 21st Century, it is unacceptable for society to be controlled or intimidated by technology. Because the American culture is distinctly characterized as technological, it becomes the function of Technology Education to give every student an insight and understanding of the technological nature of the culture. Technology Education capitalizes on the individual's potential for reasoning and problem solving, for imagining and creating, and for constructing and expressing through the use of tools and materials related to technology. It develops content and experiences to contribute to the growth and development of students commensurate with their potential. Thus, Technology Education is a basic and fundamental study for all persons in regard to career explorations and education opportunities.

An integral component of the Technology Education programs is the Technology Student Association (TSA). TSA's mission is to promote leadership and personal growth for its members in a technological society. TSA is training students to meet the challenges of the future. In addition, students are learning civic responsibility and exploring career opportunities. They are involved in activities that continuously motivate students to do their very best. TSA includes educators, parents, and business leaders who believe in the need for a technologically literate society.

The TECHNOLOGY STUDENT ASSOCIATION NATIONAL ADVISORY COUNCIL is formed for the purpose of providing guidance to TSA in the areas of program development, financial matters, professional improvement, and Technology Education promotion within education, business, industry, and government.

By promoting Technology Education, individuals will develop a positive attitude towards technology and its significance to the individual, society and the environment. Business and industry will be enhanced by a workforce with increased technological knowledge, understandings, and skills that are necessary to function in the areas of career, personal affairs, and government.

Therefore, on behalf of the TSA membership and the TSA, Inc. Board of Directors, it is with great pleasure that you, as a representative of your organization, are recognized as an official member of the Technology Student Association National Advisory Council.

U.S. Dept. of Agriculture
TSA National Advisory Council Member

Sterling Wilcox
Representative

TSA Executive Director

November 18, 1991
Date

Barrier Free Horse Ramp

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Introduction

CRESCENT MOUNTAIN TRAILHEAD on the Sweet Home Ranger District of the Willamette National Forest now has an accessible horse ramp. Horses or any livestock can be unloaded from a stock truck or any other vehicle with a bed height of 32 inches. The ramp allows a rider in a wheelchair to mount and dismount a horse. Deborah Dorman, the project engineer, stated the "Horses provide the legs to expand the world for these folks." Clearly, the barrier free horse ramp has made many visitors to the facility happy.

Pat Gorder, a new member of Horseback Outdoor Recreation Scenic Experience Services (HORSES) (an Oregon-based organization for handicapped riders), expressed sheer delight at the expansion of her world, created by the opportunity to mount a horse and ride. Pat said, "These facilities allow me to go places where the wheelchair can't go. They open new areas and create additional options."

The Designer's Own Story

This project has been a meaningful learning experience, and as an added bonus, we have received positive reponses from all over the United States.

I work in Engineering and was an inspector on a timber sale that used the trailhead as a waste area for excess dirt. The original thought was to enhance the area for parking. One day, my boss and I were talking about how it would be handy to have an unloading ramp and hitching post available for the public.

At this same time I was meeting with a lot of horse groups about the proposed horse camp we want to establish. I met Kerrill Knauf, who founded HORSES. She asked, "Why not build a ramp that would be barrier free and accessible to all visitors?" Clearly, such adjustments wouldn't be difficult to make. The

ramp would be lower with less slopes. We had the room and a trail suitable for everyone's abilities.

With that thought in mind, things just fell into place. My boss suggested that we use some timbers stored at an old compound, which were left over from a bridge we had rebuilt. They were stamped with the year 1954. Of course, getting them out from under the berry bushes they had been under for the the past 10 years was a real chore.

We rented a 235 backhoe which was used at the timber sale project to dig the holes for center posts. The total cost was $600; $400 for the backhoe. Our Engineering team volunteered all labor. A president and vice-president of a paving company volunteered a half day to put in the hitching post holes. They were at the timber sale at the time and became a partner. They were horse people and thought the whole idea was a good one.

At the end of this article, we have provided a materials list to help with the nuts, bolts, screws, rebar, and so forth. Keep in mind that an unloading/ loading ramp does not need to be built at this strength. We used what we had on hand. A lot of reconstruction is going on, and people will give away useable lumber just so they won't have to hassle with it. Since enthusiasm is contagious, they will become partners in the project. For instance, next to the old compound I talked about before, the county is restoring a covered bridge. Just by asking we got enough timber to build a fishing platform and the county will be listed as a partner.

We used the YCC kids to do the clean-up, throw sticks, rocks, and so on. They built a low grade trail and a sitting bench.

For More Information

Deborah Dorman, Sweet Home Engineering, has created a display showing the development of this project, along with copies of the plans, which she willingly shares. A videotape of Pat Gorder, member of HORSES and a Forest Service volunteer, using the ramp is also available. Contact Deborah Dorman at Sweet Home Ranger Station, 503-367-5168, or D.Dorman:R06F18D03A.

Materials List (Ramp)

Quantity	Description
6	6"x16' OLD BRIDGE TIMBERS. Can use 4"x16'. Would need additional center post for front.
6	6"x6"Xx10' USED SIGN POST. Need 1 more if use 4"x16' above.
3	2"x6"x10' TREATED LUMBER.
1	2"X4"X8' SPACER FOR RAIL.
1	4"DIA x8' PEELED POLE (We used native material).
36	3/4"DIA x12" MACHINE OR CARRIAGE BOLTS, or 10 " if use 4"x16' with washers and nuts.
4	OLD WELDED HORSE SHOES (8=1/4" bolts, carriage bolts to hold shoes on).
4	3/8"x20' REBAR. 3/4"x30" THREADED ROD (welded to rebar).
4	NUTS + 4 BRIDGE WASHERS.
1/2 lb	LARGE DUPLEX NAILS to hold things in place during assembly.
14	1/2"x8" CARRIAGE BOLTS with nuts and washers for hand rails.

MATERIALS LIST (TIE RAIL)

4	OLD USED TELEPHONE POLES. Plans show only one rail, but we built two, 6"-12"X8'.
2	4"-6" DIA X12' TREATED ROUND FENCE POST.
4	1/2"x14" CARRIAGE BOLTS driven through rail into top of post.

EQUIPMENT LIST

Quantity	Description
1	110 VOLT GENERATOR.
1	100' POWER CORD. 1/2" HEAVY DUTY DRILL.
1	HAND LEVEL.
?	WRENCHES TO FIT BOLTS.
1	3/4"x7/8" DIA x 18" WOOD BORING BIT for drilling countersinks for bolt and bridge washers. Do this before drilling the above holes.
1	1/2"x15" WOOD BIT for drilling into tie rail post.
1	SKILSAW for trimming rails.
1	POWER SAW for topping posts of tie rail.
4	GRUNTS with hand tools, shovels, and so forth.
1	BACKHOE or power drill to dig post hole and for backfilling.

BY WES DATE 8-6-91 SUBJECT SHEET NO. 1 OF 1

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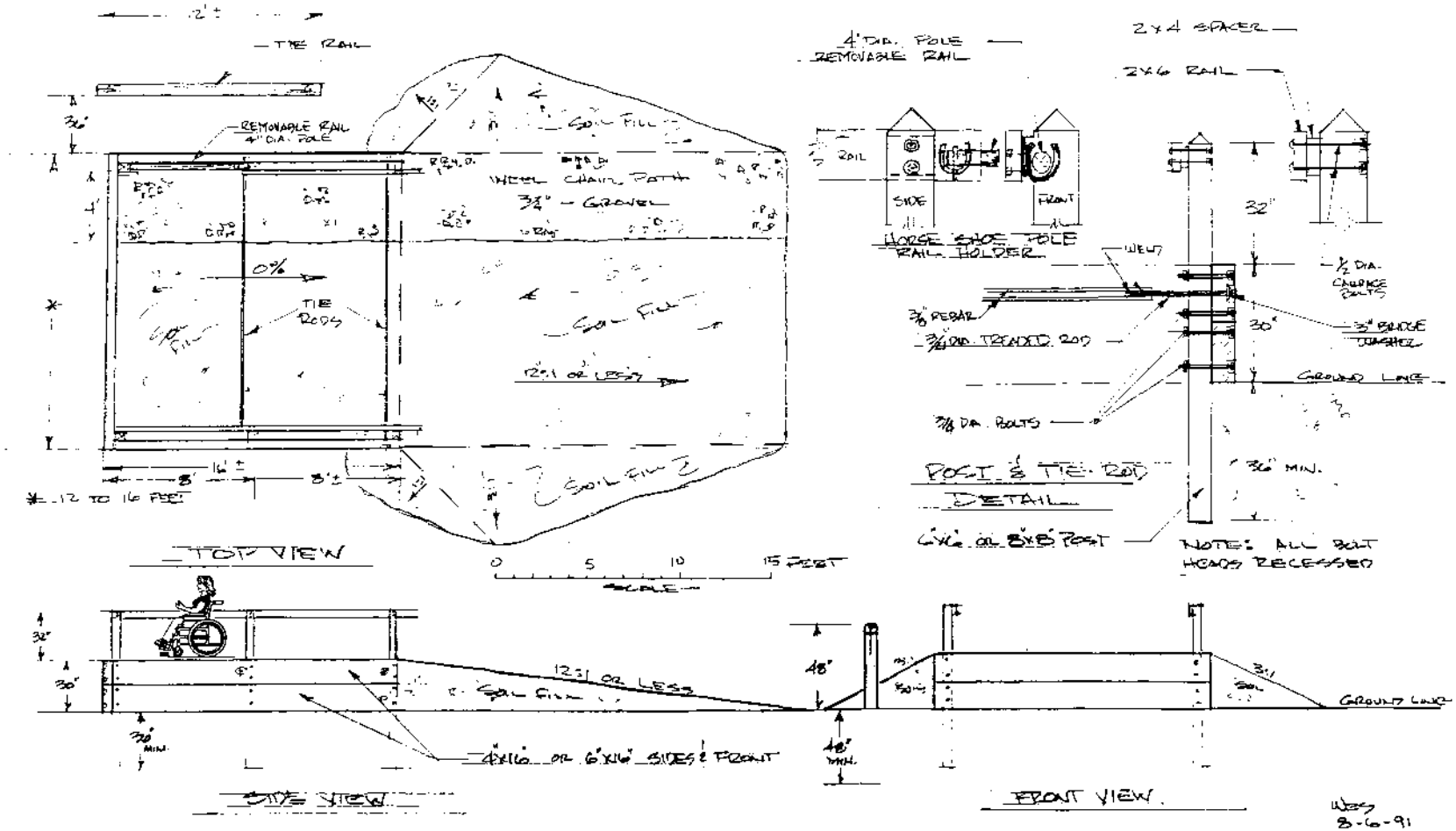
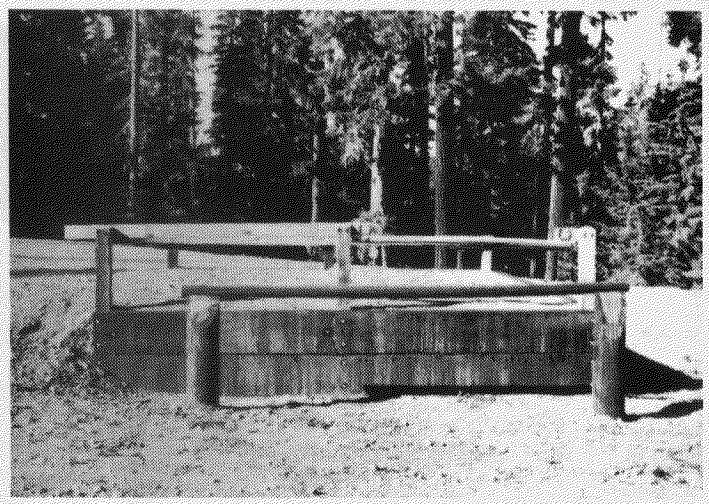
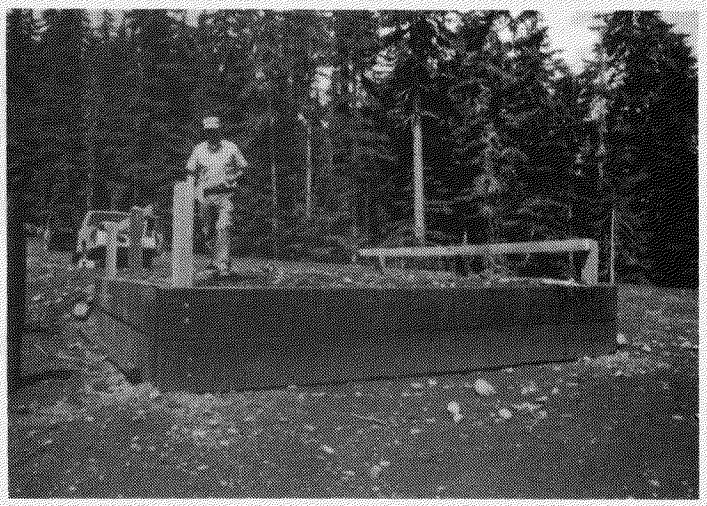
BARRIER FREE HORSE MOUNTING/UNLOADING RAMP



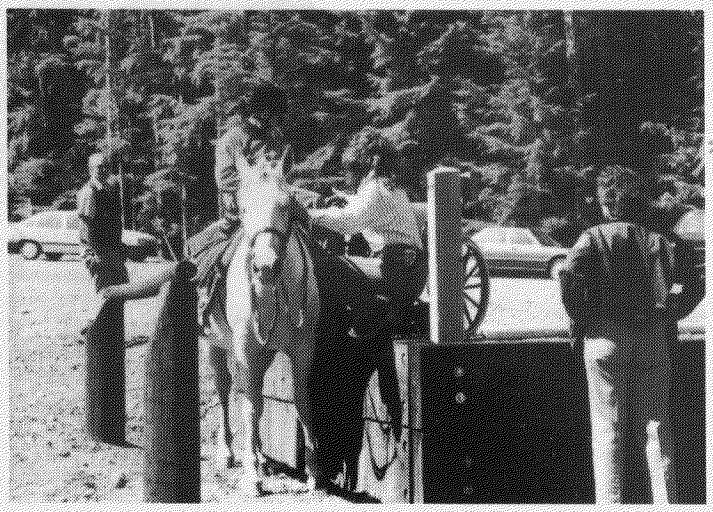


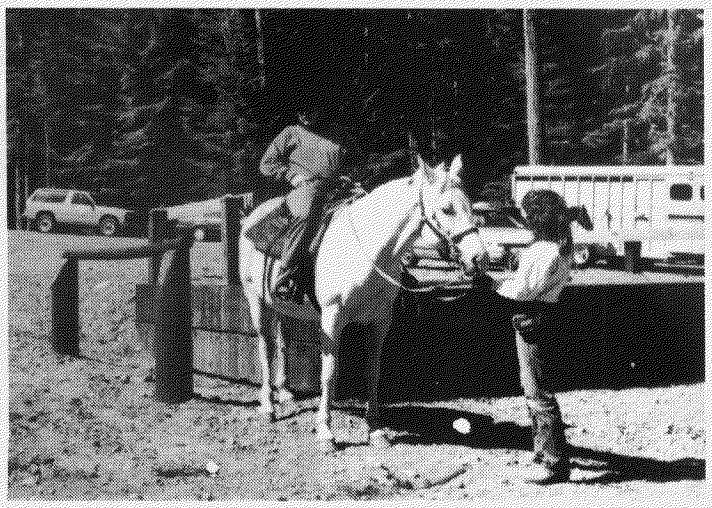
Crescent Mountain Horse Ramp.

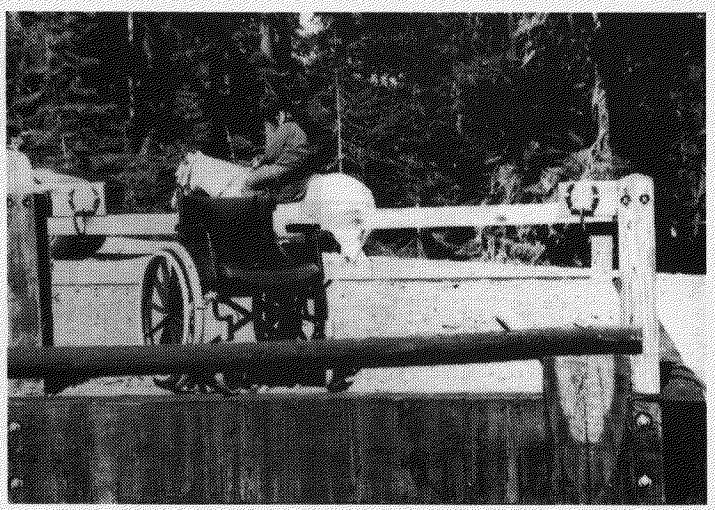


Horse Ramp under construction.

Removable railing to allow access to persons with disabilites.







Horse ramp in use.

Engineering Management Series

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The Series

THE ENGINEERING MANAGEMENT SERIES is published periodically as a means of exchanging engineering-related ideas and information on activities, problems encountered and solutions developed, or other data that may be of value to Engineers Service-wide.

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Field personnel should send material through their Regional Information Coordinator for review by the Regional Office to ensure inclusion of information that is accurate, timely, and of interest Service-wide.

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