United States
Department of
Agriculture

Forest Service

**Engineering Staff**

Washington, DC

# Engineering Field Notes

Volume 36
Issue 2—2004

## Engineering Technical Information System



—Deadline for *Engineering Field Notes* submissions for Volume 37, Issue 1—2005: February 16, 2005

# Engineering Field Notes: Guidelines for Authors

Proposed articles for *Engineering Field Notes* (EFN) should be double-spaced text in 10- or 12-point Times or Times New Roman type fonts, left margin justified, ragged right. To ensure that design layout conforms to USDA Forest Service publication standards, submit graphic elements, such as tables, charts, and photographs as separate files. Submit manuscripts as Microsoft Word documents (either Macintosh or Windows format) on 3.5-inch floppies, Iomega products (ZIP 100), or recordable CDs, or send by e-mail.

When soliciting photographs for your document, encourage photographers to capture the sharpest image possible by moving close to the primary subject, so that it fills at least three quarters of the frame. Request vertical and horizontal photos in at least three different exposures for each subject to allow maximum design flexibility. (For cameras that lack adjustable f-stop lens settings, use the +/- exposure adjustment for different exposures.)

Photographers must use digital cameras that provide print or publication quality images. Provide 1-megabyte .jpeg files (for electronic use) or 5-megabyte .tif files for print publications. Designers can convert jpegs into .tif files for professional page layout.

Use of Kodak photo CDs, agency-provided desktop scans, or images from online sources are not recommended. Such images often have insufficient clarity (required minimum resolution is 300 dpi or dots per inch.) Internet photos generally have a 72-dpi resolution.

Provide sources for all photographs and have written permission for use of non-USDA Forest Service material. (Standard permission forms are available.) Photographs must be cleared through the USDA Forest Service–Office of Communication and USDA Photo Division.

Follow USDA guidelines for current information on including photographs in your document. See *http://www.usda.gov/agency/oc/design*.

1. Slides (originals or first generation duplicates, preferably multiple frames of each subject) housed in a protected box or archival slide sheet.

2. Transparencies (4 by 5 inches or larger, preferably multiple frames of each subject) housed in archival slide sheets.

3. Prints (4 by 5 inches or larger, glossy finish, black and white or color format).

For additional information on preparing documents for the Engineering Management Series, contact Sandy Grimm, Engineering Publications (phone: 703–605–4503, e–mail: *sgrimm@fs.fed.us*).

## Engineering Field Notes: Administrative Distribution

**The Series—**The Engineering Management Series is published periodically as a means for exchanging engineering-related ideas and information on activities, problems encountered and solutions developed, and other data that may be of value to engineers Servicewide.

**Submittals—**Field personnel should send proposed articles for *Engineering Field Notes* (see Guidelines for Authors) through their regional information coordinator for review by the regional office to ensure inclusion of information that is accurate, timely, and of interest Servicewide.

### Information Coordinators

R1, Marcia Hughey
R2 Acting, Veronica Mitchell
R3, Marjorie Apodaca
R4, Walt Edwards
R5, Gwen Harris-Nishida
R6, Cheryl Clark
R8, Bob Harmon
R9, Cliff Denning
R10, John Wooton
GSTC, Marcia Thomas
MTDC, Bert Lindler
RSAC, Vacant
SDTDC, Susan Clements
WO, Sandy Grimm
WO Infra, Tah Yang

**Inquiries—**Regional information coordinators should send material for publication and direct any questions, comments, or recommendations to the following address:

USDA Forest Service, Engineering Staff • Attn: Sandy Grimm, Editor
Stop Code 1101, 1400 Independence Ave., SW. • Washington, DC 20250–1101
Telephone: 703–605–4503 • E–mail: *sgrimm@fs.fed.us*.

## Engineering Field Notes: Administrative Distribution

The USDA Forest Service assumes no responsibility for the interpretation or application of the information by other than its own employees. The use of trade names and identification of firms or corporations is for the convenience of the reader; such use does not constitute an official endorsement or approval by the United States Government of any product or service to the exclusion of others that may be suitable.

## Gary Campbell—WO Engineering's New Deputy Director

Gary began his USDA Forest Service career as a trainee on the Bighorn National Forest in his hometown of Sheridan, WY, after earning a bachelor's degree in civil engineering at the University of Wyoming. He spent 6 years with the Bighorn National Forest staff before going to the Plumas National Forest in the Pacific Southwest Region. After 6 years in California, Gary joined the Humboldt-Toiyabe National Forest staff in the Intermountain Region for 5 years and then headed to the Intermountain Regional Office in Ogden, UT, as the engineering budget coordinator. After a short stint in Ogden, Gary transferred into the Washington Office (WO) Engineering staff as the Technology and Development program manager. He was promoted to assistant director of engineering with responsibility for overseeing the programs of Technology and Development, environmental engineering, fleet equipment, and all WO engineering operations.

Gary brings a wide range of experience within the USDA Forest Service to the position of deputy director. His recent educational experiences include a Harvard Senior Executive Fellowship at the John F. Kennedy School of Government and successful completion of a USDA-sponsored Senior Executive Service Candidate Development Program.

Gary is a registered professional engineer in the State of Nevada. He lives in Stafford, VA, with Cindy, his wife of 21 years, and his son, Justin. Their daughter, Ronni, lives in Phoenix, AZ. As the deputy director, Gary looks forward to providing leadership in addressing the many challenges facing the agency.

# Moving Small Mountains—Vesuvius Dam Rehab

*—Susan L. Peterson, P.E., regional dams engineer, Eastern Region, Bedford, IN*

Note: The following article, *Moving Small Mountains—Vesuvius Dam Rehab*, by Sue Peterson, February 24, 2004, is reprinted with permission from International Water Power and Dam Construction, published by Wilmington Publishing, Ltd. The Magazine's Web site is *http://www.waterpowermagazine.com*.

Major developments below Vesuvius Lake dam in Ohio, US, led to the reclassification of the 70-year old dam to high hazard status. Sue Peterson oversaw the rehabilitation work undertaken to bring the dam up to current standards

Vesuvius Lake dam is a United States Department of Agriculture (USDA) Forest Service-owned earthen dam, located in the Wayne National Forest on the southernmost tip of the state of Ohio. It is about 12.2m in height, 137.2m long, has a 1.2m corrugated metal pipe for a lake drain and a principal concrete ogee weir spillway. The dam is also part of the Lake Vesuvius recreation area of the forest and is crossed by part of the trail system. There is a footbridge across the deep concrete spillway that links the segments of the trail around the length of the lake.

In 1933, Franklin D. Roosevelt became president of the US, and began his New Deal federal programmes to pull the country out of the great depression. The aggressive programmes included the Civilian Conservation Corps (CCC), which hired men to work on federal public works projects in the National Forests and parks. Vesuvius Lake dam was built by the CCC in 1935. When it was built, it was designed to be able to store in the reservoir, or pass through its spillways, the flood resulting from a 100-year storm event.

Much has changed in this part of Ohio since 1935. The dam is located about 16km from the Ohio river and two other states; Kentucky and West Virginia. It is within an hour's drive of about half a million people. Major development has occurred downstream of the dam, including the construction of houses, a major highway and a public school. These developments led to the reclassification of the dam to a high hazard status, and it was identified in a 1990 State of Ohio Department of Natural Resources report as being severely undersized. It would pass or store approximately 37% of the design storm volume. The concrete spillway has been patched and grouted a few times over the years (figure 1).

In 1993, an engineering firm was hired to develop alternatives for the rehabilitation of the dam to bring it up to current standards. The selected alternative included providing overtopping protection of the dam by installing roller compacted concrete (RCC) over the whole dam and installing 30cm concrete overlays of the spillway vertical walls and replacement of the floor and sloped walls of the spillway.

Figure 1—Stilling basin of spillway before new concrete is installed.

The USDA Forest Service hired the US Bureau of Reclamation to carry out the design of the project. This was completed in 2000, with the resultant construction contract being awarded the following year. The value of the contract was US$3.7M for the whole project, and the concrete spillway overlays portion cost US$1.7M. The contract was funded by an appropriation of the US Congress, administered by the USDA Forest Service. The prime contractor was T-C Company, Inc. based in Indianapolis, Indiana, and the subcontractor responsible for cast-in-place concrete was D.L. Braughler Company, Inc. of Morehead, Kentucky. The construction administration was performed by the employees of the USDA Forest Service, with assistance from the US Army Corps of Engineers.

## Spillway

The concrete spillway is 125m long by 7.6–13.7m wide by 8.5m deep and the lake elevation is controlled by an ogee weir. As the concrete was 65 years old, and had been patched and grouted several times, the decision was made to overlay the vertical walls with 30cm of new concrete. The work included the removal and replacement of the floor and the sloped walls downstream of the stilling basin.

A cellular wall that parallels the entrance to the spillway and makes up a portion of the spillway wall was also encased by new concrete. On the dam side of the cellular wall, the concrete installed on the vertical face of the cellular wall was 2.2m thick at the bottom and 0.9m thick at the top. Lifts of concrete for this placement were a maximum height of 3m. The contractor had to clean the exposed bedrock under the new portion of the cellular wall so that geological mapping data could be done.

Bedrock under the dam and spillway lies approximately 14–15m below the crest and consists of a Pennsylvanian Allegheny formation (sandstone, siltstone and shale and carbonaceous interbeds.) The sandstone has a moderately hard bedding

plane and is 3m thick, while the siltstone has soft to moderately hard bedding planes and appears in thin layers. When the soil adjacent to the dam side of the cellular wall was removed, there was very little fracturing of the sandstone and it was suitable for the foundation of the new cellular wall face (figure 2).

Figure 2—Exposed bedrock under the spillway floor with grouted anchor bars installed.

## Removal of Concrete in Chute Floor

Floor sections were removed and replaced before the walls' overlays. The existing concrete in the floor of the spillway was removed along its entire length, with the exception of the stilling basin, which was left in place and overlaid with new concrete like the spillway walls. At the junction of the wall with the floor a 7.6cm saw cut was made. The original plans showed the removal of the chute floor required very little extra excavation. Once excavation of the floor began, the depth to bedrock to anchor the new floor was 0.3–2.1m. The void created by removing the old concrete and the loose material underneath was filled by the new concrete, which resulted in substantial overruns in concrete quantities. All foundation surfaces were pressure washed before the placement of new concrete (figure 3).

Figure 3—Wrecking ball on crane used to break up the spillway floor.

## Reinforcement of New Concrete

The reinforcement of the new concrete wall overlays and chute floor replacement incorporated grouted anchor bars (#4, #6 and #11), reinforcing bars and plain dowel bars. The new 0.3m wall overlays were anchored to the existing walls by drilling holes in the old concrete and #4 or #6 grouted anchor bars (depending on location in spillway) were installed every 0.9m on centre. The anchor bars were embedded at least 17cm on the right spillway wall and 0.3m into existing concrete and rock on the left wall. Attached to the grouted anchor bars was a combination of bars that formed a grid to reinforce the walls and floor of the spillway. The #6 anchor bars, reinforcing bars and plain dowel bars were installed in this grid pattern, with the opening between bars 0.3m each way. The bars were required to be embedded in a minimum of 5cm of concrete (figure 4).

Figure 4—Grouted anchor bars installed in old spillway walls.

## Concrete

Concrete installed in the spillway had to have a minimum compressive strength of 4000psi at 28 days. Portland Cement type II was used in the mix and 5±2.5cm slump was allowed. The maximum free moisture allowed was 6%. Although the contract had specifications allowing on-site batching of concrete, several ready-mix plants were within 30 mins of the project, and were used to produce all the concrete used in the spillway. Placement of concrete on grouted anchor bars required a curing period of three days after anchor installation for slabs and seven days for walls. Each placement of concrete had to cure four days before placing adjacent concrete.

Drain tiles were installed laterally and perpendicularly under the new spillway floor. The drains were 10.2cm perforated PVC drain pipe set in a 0.3m gravel trench surrounded by a sand filter that was 7.6cm thick. They drained into existing

15.2cm drain pipes that were entrenched in the stilling basin vertical wall that was not removed.

Construction joints were made every 6.1m in the floor slabs. Contraction joints on the concrete overlay on the walls matched the joints on the existing walls and 23cm PVC water stops were installed at all joints in the walls and floor slabs (figures 5, 6, and 7).

Figure 5—Forming a curved section of spillway wall.

Figure 6—Steel forms used to form spillway walls.

Figure 7—Placement of new concrete overlays of spillway walls using a drop bucket and crane.

## Ogee Weir

The original design did not call for overlaying the ogee weir as part of the rehabilitation project. However, once the work was well underway, it was decided that the original concrete in the weir looked old and worn-out when compared to the new overlays that were being installed adjacent to it. The elevation of the crest of the weir dictated the lake water elevation at normal pool and changing the water level would have an adverse effect on a beach, boat ramp, and trail system that were located at other parts of the lake. So the top 0.3m was removed from the top curve of the ogee weir and replaced in kind. The same techniques were used to attach the new concrete to the old existing concrete.

## Construction Schedules

The original contract time was 300 calendar days. The RCC on the dam was installed in the first 100 days of the contract. The conventional concrete used in the spillway took much longer than originally scheduled. The original timetable showed the concrete work scheduled for three months in the fall, when it actually took almost a year. The concrete production per day was much less than had been projected, and resulted in the contract being extended to 465 days. The specifications required each 76m$^3$ of concrete, or each day's pour of the concrete to be tested by pouring cylinders and measuring slump, temperature and air content whichever was less. The total cast-in-place concrete that was placed on the project was 1838m$^3$. The tests were taken 116 days for an average of 15.3m$^3$ per day of pour.

Not a single cylinder failed and almost all the cylinders were broken at over 5500psi at 28 days. The contractor's testing firm originally submitted a quality control plan for cast-in-place concrete, which met the intention of the contract.

Their costs were estimated at the 76m$^3$ per day and had a significant overrun by the small daily production. All the concrete pours were adequately formed, vibrated and finished, but the contractor was using old steel forms that had to be moved for each section of wall overlay which took extra time and manpower and cut down production rates. The project, although it took longer than anticipated, was very successful and completed professionally by the contractor (figures 8 and 9).

Figure 8—Finished spillway with new trail bridge and fencing installed.

Figure 9—Finished spillway including new stilling basin and partial wier in outlet of spillway.

## Built Environment Image Guide Receives Award From Landscape Architects

*—Ramiro Villalvazo, chief landscape architect, Recreation, Heritage, and Wilderness Resources, Washington Office*

The American Society of Landscape Architects (ASLA) will present a Communications Award of Merit to the USDA Forest Service for developing the Built Environment Image Guide for the National Forests and Grasslands (BEIG) at the society's annual meeting in Salt Lake City. The award is a tribute to the USDA Forest Service's successful collaboration among landscape architects, engineers, architects, and others that led to developing the BEIG, and to the content and scope of the document (figure 1).

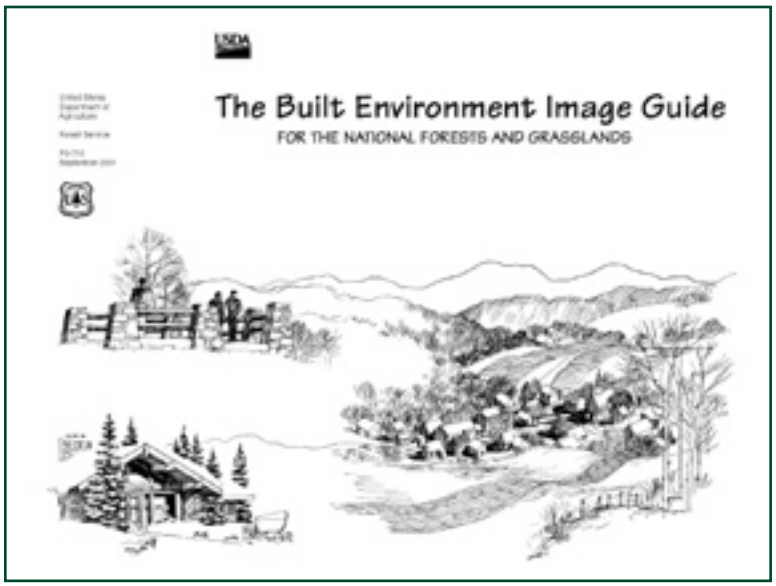


Figure 1—BEIG front cover.

The BEIG also is being recognized because the USDA Forest Service is the only Federal agency to provide facility design guidance for its entire network of public lands. Jurors called the BEIG, "a comprehensive, well-organized, beautifully illustrated guide covering a broad range of environments across the continent" and "a very valuable guide for the seasoned practitioner as well as the layperson." For more specific information about the award, see the Web site at: *http://www.asla.org/awards/2004/04winners/entry556.html*.

The well-recognized need for national facility design guidance spurred the Recreation, Heritage, and Wilderness Resources (RHWR) and the Engineering staffs from the Washington Office to begin collaborating in 1997. The partners defined clear overall objectives for ecological, cultural, and economic sustainability, embodying the rich tradition of planning and designing high-quality

USDA Forest Service facilities that are esthetically pleasing and appropriate for the agency (figures 2 and 3).

Figure 2—Round log pavillion.

Figure 3—Boardwalk in natural setting.

Another fundamental message of the BEIG is that an integrated effort is required to create and maintain quality facilities. Project proponents, decisionmakers, designers, engineers, field staff, and technicians all have an important role.

The BEIG was patiently developed over the course of several years. A Built Environment Image Team (BEIT), led by Jim Bedwell, then Chief Landscape Architect for the USDA Forest Service, directed and oversaw the guide's development. The team also included an architect, three facility engineers, a line officer, and two landscape architects. Private consultants from architecture and landscape architecture firms, an illustrator, a historian, and a writer helped design and refine the final content.

The BEIT and consultants orchestrated five design charettes (intensely focused problem-solving sessions) across the country to collect regional design and architectural character information. They sought to understand how natural landscape settings, culture, history, and climatic conditions influenced the first 100 years of USDA Forest Service design tradition and construction styles. USDA Forest Service professionals from all the design disciplines, line officers, and maintenance and operation technicians participated.

The BEIT team and consultants synthesized the data collected to develop and designate eight distinct geographic provinces, each with its own architectural vocabulary and guidelines. The extensive use of images and sketches does an exceptional job of communicating the details and nuances that distinguish each design element within its own regional application (figures 4 and 5).

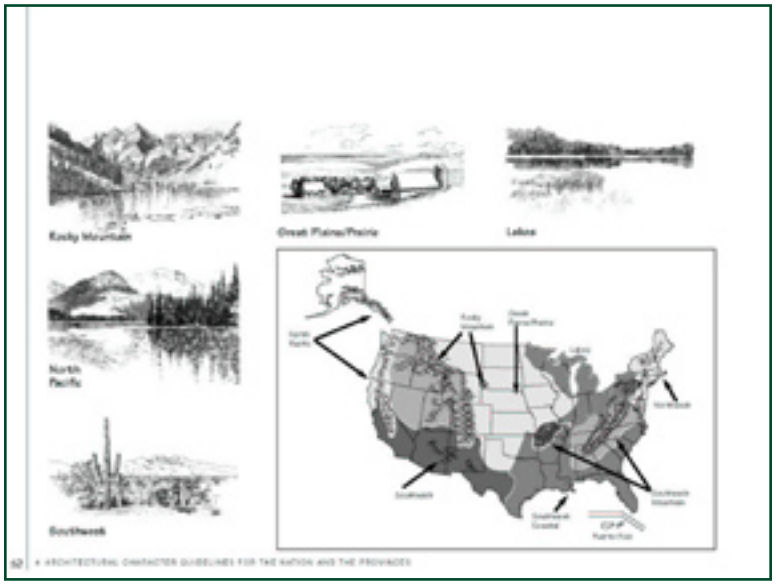

Figure 4—Province map.

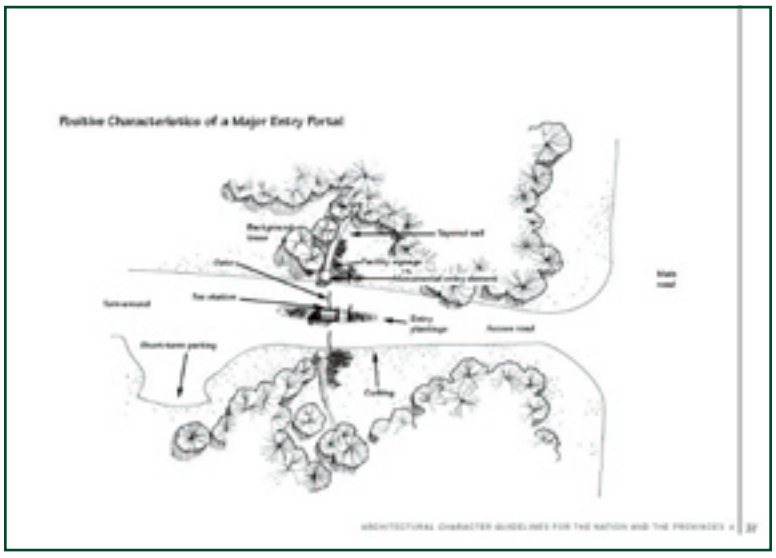


Figure 5—Plan view sketch.

The province concept classifies where each national forest and grassland is located within an architectural character as defined by climate, culture, and landscape setting. The team identified eight ecological and cultural provinces in the continental United States and Alaska. However, the team recognized that province lines are "fuzzy" and anomalies do exist within each province. Because of changes in topography, climate, and landscape across boundaries, design for even a single forest may need to consider guidelines for multiple provinces.

To encompass the many factors that influence facility planning and design on and close to national forests and grasslands, the BEIG was developed as a tool, not a design catalog or "cookbook." It encompasses more than the internal USDA Forest Service requirements. The agency routinely works with partners, collaborators, special-use permitees, adjacent landowners, and others who construct facilities on or near lands managed by the USDA Forest Service. The BEIG is a planning and design tool that provides guidelines and suggests the steps and processes necessary to ensure that each facility is constructed according to the appropriate overall USDA Forest Service image or the message that the facility will deliver.

The BEIG was produced as a three-ring binder to encourage USDA Forest Service regions and field unit personnel to add design ideas, images, and sketches to reflect local requirements or needs. The BEIG has been widely distributed across the USDA Forest Service and shared with sister Federal agencies, universities, private design firms, and international organizations.

The San Dimas Technology and Development Center (SDTDC) has developed comprehensive, high-quality BEIG training packages and programs. They have been delivered at regional training academies and at "Train-the-Trainer" sessions. The training packages are posted on the SDTDC Web site at: *http://fsweb.sdtdc.wo.fs.fed.us/beig/BEIG_Training/default.htm*

The entire BEIG can be viewed on the Internet at: *http://www.fs.fed.us/recreation/programs/beig* or downloaded from *ftp://ftp2.fs.fed.us/incoming/beig*.

To achieve the goals that inspired the development of the BEIG, the USDA Forest Service must embrace and implement the guide's messages. The agency must "walk the talk," leading the way in natural resources conservation and public land stewardship (figures 6 and 7).

The USDA Forest Service is making good progress in incorporating the BEIG into day-to-day operations. Forest and grassland units produce design standards and guidelines complementary to the BEIG that tier down (provide more specific guidance based on local conditions). Other units use design charettes to initiate projects, employing interdisciplinary approaches, establishing clear project objectives, and incorporating sustainable practices.

Figure 6—
Mendenhall Glacier.

Figure 7—
Seneca Rocks
Discovery Center,
Monongahela
National Forest,
Elkins, WV.

A letter from Chief Dale Bosworth that prefaces the BEIG encourages the agency to embrace the value and importance of providing facilities that are sustainable, fit the landscape, and provide an excellent image and national consistency. He urges the professionals who plan and design facilities for the USDA Forest Service to "do it right," and to "Take pride in providing facilities of character, efficiency, and enduring tradition, much as you value those qualities in our agency as a whole."

Questions about the BEIG and its application can be sent by e-mail to Bill Hamele, assistant manager, facilities program, at: *whamele@fs.fed.us*, or to Ramiro Villalvazo, chief landscape architect, at: *rvillalvazo@fs.fed.us*.

# Accessible Handpump for Campgrounds

*—Bert Lindler, supervisory technical editor, Missoula Technology and Development Center*

A handpump that meets accessibility standards is now available for USDA Forest Service campgrounds.

The pump, which has been patented by the Federal Government, is being manufactured by the Simple Pump Co. in Gardnerville, NV, as the ADA 100 Rotary Handpump. A single pump sells for $2,250, but the cost per pump can be reduced to $1,900 if 100 pumps are ordered.

If national forests place orders now and delay delivery until spring, USDA Forest Service orders will accumulate, allowing the cost per pump to be reduced.

MTDC developed the new rotary handpump, which meets the standards of the Americans with Disabilities Act (ADA) and the Architectural Barriers Act accessibility guidelines. The standard handpump can be difficult or impossible to operate because it requires strength and a long reach to raise and lower the pump handle. The new rotary handpump takes just 5 pounds of force to operate, can be used with a closed fist, and works even if the handle is pushed back and forth by someone who can't rotate it (figure 1). The new handpump will raise water 60 feet and can pump about 1½ gallons of water per minute.

Figure 1—Operating the handpump can be accomplished easily.

The USDA Forest Service's Technology and Development program was asked to find or produce a hand-operated water pump. Project leader Bob Beckley was unable to find an accessible handpump. He sought the help of mechanical engineer Tyler Kuhn and engineering technician Chuck Harding. They designed a prototype that was produced in the center's metal fabrication shop and tested at USDA Forest Service campgrounds (figure 2). A tech tip, *Accessible Handpump for Forest Service Campgrounds* (0371–2333–MTDC), describes the handpump's development. It is available to USDA Forest Service and U.S. Department of the Interior Bureau of Land Management employees at: *http://fsweb.mtdc.wo.fs.fed.us/pubs/htmlpubs/htm03712333*.

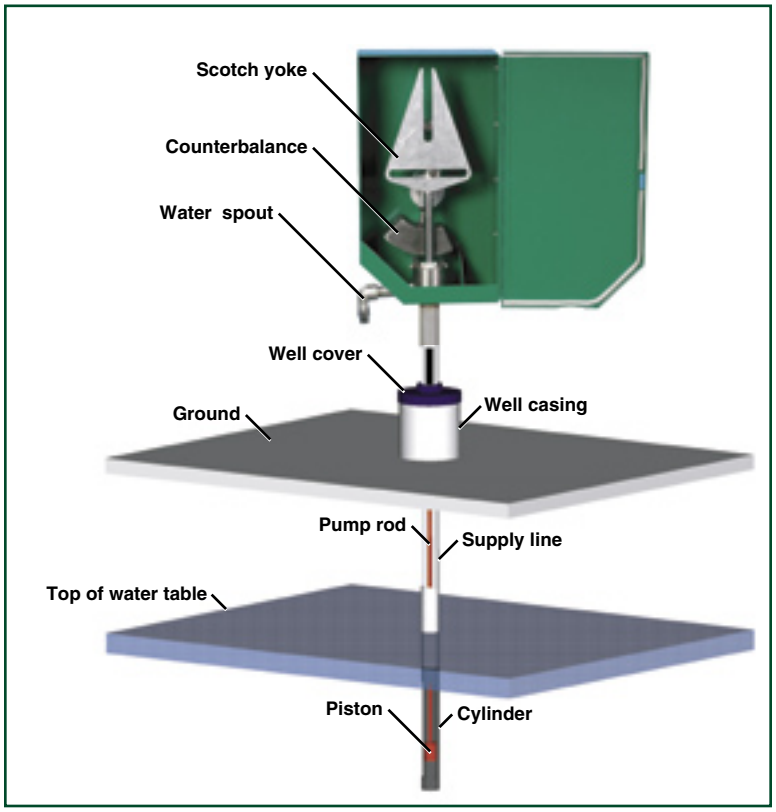


Figure 2—Graphic of the prototype handpump.

To order the ADA 100 Rotary Handpump, contact the Simple Pump Co., 1140 Amarillo Drive, Gardnerville, NV 89460; phone: 877–492–8711; e–mail: *gary@simplepump.com*. For additional information about the accessible handpump, contact Bob Beckley (phone: 406–329–3996; e–mail: *rbeckley@fs.fed.us*).

## 2003 *Engineering Field Notes* Article Award Winners

Thank you for voting for your favorite *Engineering Field Notes* (EFN) articles. Nominating the top three articles is one way to recognize the authors who wrote those articles.

It takes time and energy for busy engineers to write articles for *Engineering Field Notes*. We rely on our authors to share their time, knowledge, and experience. The articles continue to save the U.S. Department of Agriculture (USDA) Forest Service time and resources.

The following winning authors will receive cash awards for 2003 EFN articles:

John Kattell for *Packable Trail Bridges*

Kathie Snodgrass for *Is There a Fuel Cell in Your Future?*

Bert Lindler for *Technology and Development Innovations Now on the Internet*

Congratulations to the winners and to the authors who contribute articles. For tips on how to submit your article, see the *Engineering Field Notes: Guidelines for Authors* in this issue.

# Engineering Bulletin Board

To share noteworthy engineering information, please send your contributions to Sandy Grimm at: *sgrimm@fs.fed.us*.

## Career Changes, July to December 2004

**Geospatial Services and Technology Center (GSTC)—**Photographic Technician Wes Bryant became a cartographic technician in the Digital Elevation Model Unit of Photogrammetry in June and Purchasing Agent Nelda Montgomery was promoted in early July. For 2 months this summer, GSTC Supervisory Contract Specialist Jo Lippire was the acting director of acquisition management in Region 2. Two contract specialists from other units—Ron Penrose, from the Lolo National Forest, and Tori Blunt, from the Ashley National Forest, supported the GSTC staff in June and July.

**Remote Sensing Applications Center (RSAC)—**Kelly Williams joined RSAC in June through the Student Temporary Employee Program (STEP). Kelly assists the staff with the daily operations of the MODIS Active Fire mapping program and manages the USDA Forest Service satellite image archive. Keith Lannom, RSAC's operations program leader, will become the Tellico District Ranger for the Cherokee National Forest.

**Missoula Technology and Development Center (MTDC)—**Tammy Petersen joined MTDC as a financial technician in March. Two additional employees arrived during the summer: Kendall Mingey is a Web intern and Connie McMichael is the new electronics lab technician. Maggie Pittman, support program leader, became the Missoula District Ranger for the Lolo National Forest on October 4. She served as acting district ranger for 4 months this summer.

**San Dimas Technology and Development Center (SDTDC)**—Ralph Gonzales was promoted to fire program leader upon Ralph Taylor's retirement. Tony Edwards transferred to the Pike and San Isabel National Forests as the Physical Resources staff officer.

**Washington Office (WO)—**Belated recognition goes to SDTDC's Brent Norum for his invaluable behind-the-scenes computer assistance during two stints in the Washington Office earlier in the year. Summer details included Craig Lasser's 2 weeks with the Recreation, Heritage, and Wilderness Resources staff as a budget coordinator and Bill Hamele's 6-week detail to the Clearwater National

Forest through early September. Craig also spent late September through November as the Acting South Zones Engineer in Custer, SD. Bethany Barron, on a 2-week detail from the Rocky Mountain Region, worked closely with the Infra staff on a new wastewater module during Craig's absence.

Two new employees joined the Washington Office staff in July. Patti Witherspoon, the staff's budget analyst, was formerly with the USDA Forest Service Program and Budget staff. Infra welcomed new program manager Daryl Herman from the USDA Forest Service Forest and Rangelands staff.

Although Kurt Gernerd officially assumed his duties as the new assistant director for the Technical Engineering and Support staff in October, he attended the September Regional Engineer meeting in Albuquerque while completing his service with the U.S. Department of the Interior. Bobbi Baca took over as program manager for the Environmental Compliance and Protection program manager on November 1 after serving as the regional environmental engineer in Region 3. In mid-November Marion Rackley, formerly the program analyst for the Washington Office staff, stepped into the support program leader position vacated by Maggie Pittman at the Missoula Technology and Development Center.

# Bibliography of Publications from Washington Office Engineering and Service Centers

This bibliography contains information on publications and other materials produced by the Washington Office Engineering staff and its service centers. Arranged by series, the list includes the title, author or source, document number, and date of publication.

This issue lists material published since our last bibliography (*Engineering Field Notes*, Volume 35, Issue 2 2003). Copies of *Engineering Field Notes* and most Engineering Management Series documents can be obtained from the Washington Office Engineering staff or from the Forest Service Intranet at: *http://fsweb.mtdc.wo.fs.fed.us/php/efn_journals.php?var=Engineering%20Field%20Notes*. Copies of reports, Tech Tips, videotapes, compact disks, and digital video disks can be obtained from the center listed as the source. MTDC and SDTDC documents are also available at: *http://www.fs.fed.us/t-d/pubs/* (username t-d, password t-d). A number of special reports sponsored by the Geospatial Executive Board and authored by Geospatial Advisory Committee teams are available through the Geospatial Services and Technology Center and the Remote Sensing Applications Center.

USDA Forest Service
Attn: Washington Office (WO) Engineering Staff, Sandy Grimm
Stop Code 1101
1400 Independence Avenue, SW.
Washington, DC 20250–1101
Phone: 703–605–4503

USDA Forest Service
San Dimas Technology and Development Center (SDTDC)
444 East Bonita Avenue
San Dimas, CA 91773
Phone: 909–599–1267

USDA Forest Service
Missoula Technology and Development Center (MTDC)
5785 Highway 10 West
Missoula, MT 59808
Phone: 406–329–3900

USDA Forest Service
Remote Sensing Applications Center (RSAC)
2222 West 2300 South
Salt Lake City, UT 84119
Phone: 801–975–3750

USDA Forest Service
Geospatial Services and Technology Center (GSTC)
2222 West 2300 South
Salt Lake City, UT 84119
Phone: 801–975–3473

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

*Engineering Field Notes* (EFN)—This publication, published every 6 months, provides a forum for the exchange of information among U.S. Department of Agriculture (USDA) Forest Service personnel. It contains the latest technical and administrative engineering information and ideas related to forestry.

## EFN by Title (Volume 36)

## EFN by Author (Volume 36)

| | |
|---|---|
| Villalvazo, Ramiro | Built Environment Image Guide Receives Award from Landscape Architects (Issue 2 2004): 9–13 |

## Other Publications

### Project Reports

| Title | Number | Source | Date |
|---|---|---|---|
| Updating Land Type Association Mapping Techniques in Region 6 Using the Terrestrial Ecological Unit Inventory (TEUI)-Geospatial Toolkit (by D.R. Ufnar, Bruce Frazier, Alan Busacca, Duane Lammers, and Haans Fisk) | RSAC–0038-RPT2 | RSAC | 05/04 |
| Tamarisk Remote Sensing Inventory and Assessment (by Denise Laes, Paul Maus, Henry Lachowski, Tom McClure, and Willa Holgate) *http://fsweb.rsac.fs.fed.us/documents/0046-RPT1.pdf* | RSAC–0046-RPT1 | RSAC | 08/04 |
| Tamarisk Remote Sensing Inventory and Assessment (by Denise Laes and Paul Maus) *http://fsweb.rsac.fs.fed.us/documents/0046-TIP1.pdf* | RSAC–0046-TIP1 | RSAC | 08/04 |
| Riparian Area Burn Analysis: Process and Applications (by Haans Fisk, Kevin Megown, and Lynn M. Decker) *http://fsweb.rsac.fs.fed.us/documents/0057-TIP1.pdf* | RSAC–0057-TIP1 | RSAC | 08/04 |

| Title | Number | Source | Date |
|---|---|---|---|
| Mapping and Monitoring Non-system Trail Change With Remote Sensing and GIS (by Chuck Werstak, Vicky Johnson, Paul Maus, Henry Lachowski, Linda Meriglano, Max Molyneux, and Noelle Meier) | RSAC–0063-RPT2 | RSAC | 07/04 |
| Post Fire Burn Severity Classification of the Hayman Fire, CO: Based on Hyperspectral Data– JFSP RFP 2001-2 Task 1 (by Denise Laes, Paul Maus, Sarah Lewis, Pete Robichaud, and Ray Kokaly) | RSAC–0068-RPT1 | RSAC | 09/04 |
| Range Management Using Remote Sensing and GIS (edited by Vicky Johnson and Debbie Webster) *http://fsweb.rsac.fs.fed.us/documents/0901-CMP1.pdf* | RSAC–0901-CMP1 | RSAC | 03/04 |
| Sky Research Deployment, Missoula, Montana, 2003 (by Thomas Zajkowski) *http://fsweb.rsac.fs.fed.us/documents/1308-RPT1.pdf* | RSAC-1308-RPT1 | RSAC | 10/03 |
| Infrared Field Users' Guide and Vendor Listings (by Thomas Zajkowski, Lloyd Queen, and Darrell VanBuren) *http://fsweb.rsac.fs.fed.us/documents/1309-RPT2.pdf* | RSAC–1309-RPT2 | RSAC | 07/04 |

| Title | Number | Source | Date |
|---|---|---|---|
| License Plate Recognition System (by James Tucker) *http://fsweb.rsac.fs.fed.us/documents/1406-TRP1.pdf* | RSAC–1406-TRP1 | RSAC | 08/04 |
| Unmanned Aerial Vehicle Technology for the United States Forest Service (by Thomas Zajkowski) *http://fsweb.rsac.fs.fed.us/documents/1507-RPT1.pdf* | RSAC–1507-RPT1 | RSAC | 09/03 |
| Remote Sensing Imagery Support for Burned Area Emergency Response Teams on 2003 Southern California Wildfires (by Jess Clark, Annette Parson, Tom Zajkowski, and Keith Lannom) *http://fsweb.rsac.fs.fed.us/documents/2003-RPT1.pdf* | RSAC–2003-RPT1 | RSAC | 12/03 |
| Resource Photography, Digital Cameras, Satellite Imagery, and Feature Analysis–A Forester's Remote Sensing Toolkit (by Karen Owens) | RSAC–3008-RPT1 | RSAC | 09/04 |
| Sampling Rare Elements (by Kevin Megown, Bonnie Ruefenacht, Mark Finco, Jule Caylor) *http://fsweb.rsac.fs.fed.us/documents/4007-RPT1.pdf* | RSAC–4007-RPT1 | RSAC | 12/03 |

| Title | Number | Source | Date |
|---|---|---|---|
| Technical Support to Forest Inventory and Analysis: Pre-Field Evaluation (by Richard Warnick, Jule Caylor, Mark Finco, Barbara Lasen, Dianna Schilde, Mark E. Nelson, Dale Gormanson, Jamie K. Cochran, Roger Boyer, James Menlove, and Bob Johnston) *http://fsweb.rsac.fs.fed.us/documents/4010-RPT1.pdf* | RSAC–4010-RPT1 | RSAC | 10/03 |
| Developing Remote Sensing Methods To Assess the Effects of Large Floods at a Regional Scale (by Charlie Schrader-Patton, Jule Caylor, Mark Finco, and Juan de la Fuente) *http://fsweb.rsac.fs.fed.us/documents/4011-RPT1.pdf* | RSAC–4011-RPT1 | RSAC | 11/03 |
| Using the Digital Transfer Scope (DTS) To Collect and Transfer Data Interpreted from Hardcopy Photos to a Geospatially Referenced Database (by Jess Clark, Jule Caylor, and Mark Finco) *http://fsweb.rsac.fs.fed.us/documents/4014-RPT1.pdf* | RSAC–4014-RPT1 | RSAC | 10/03 |
| Application and Cost Analysis of Digital Large-Scale GPS-Controlled Aerial Photo Sampling for Pinyon-Juniper Forest Inventory (by Kevin Megown, Jule Caylor, Mark Finco, and Gretchen Moisen) *http://fsweb.rsac.fs.fed.us/documents/4015-RPT1.pdf* | RSAC–4015-RPT1 | RSAC | 02/04 |

## TECH TIPS

| Title | Number | Source | Date |
|---|---|---|---|
| Brush-Clearing Head Evaluation (by Andy Trent) *http://fsweb.mtdc.wo.fs.fed.us/pubs/htmlpubs/htm03242336* | 0324–2336 | MTDC | 12/03 |
| Manual Post Drivers for 8- to 12-Foot-Long Metal Posts (by Gary Kees) *http://fsweb.mtdc.wo.fs.fed.us/pubs/pdfpubs/pdf03242340/pdf03242340dpi300.pdf* | 0324–2340 | MTDC | 12/03 |
| Osborne Firefinder (by Joe Fleming and Rich Robertson) *http://www.fs.fed.us/eng/pubs/html/03511311/03511311.html* | 0351–1311 | SDTDC | 11/03 |
| Fire Shelters Weaken Transmissions From Hand-Held Radios (by Ted Etter) *http://fsweb.mtdc.wo.fs.fed.us/pubs/htmlpubs/htm03512342* | 0351–2342 | MTDC | 12/03 |
| Safe Use of Cranes and Hoists (by Susan Jenkins, Ian Barlow, and Bob Beckley) *http://fsweb.mtdc.wo.fs.fed.us/pubs/htmlpubs/htm03672328* | 0367–2328 | MTDC | 09/03 |
| The Outback Savannah Road Grader (by Leo Ruiz) *http://fsweb.sdtdc.wo.fs.fed.us/pubs/html/03771310/03771310.htm* | 0377–1310 | SDTDC | 10/03 |

| Title | Number | Source | Date |
|---|---|---|---|
| Portable Rock Crusher for Trails (by Ellen Eubanks) *http://www.fs.fed.us/eng/pubs/html/04231301/04231301.html* | 0423–1301 | SDTDC | 03/04 |
| Wood Strands as an Alternative to Agricultural Straw for Erosion Control (by Randy Foltz) *http://www.fs.fed.us/eng/pubs/html/04231302/04231302.html* | 0423–1302 | SDTDC | 07/04 |
| Portable Vault Toilet Service Unit (by Brenda Land) *http://www.fs.fed.us/eng/pubs/html/04231304/04231304.html* | 0423–1304 | SDTDC | 07/04 |
| Portable Pressure Washer for Cleaning Recreational Sites (by Brenda Land) *http://fsweb.sdtdc.wo.fs.fed.us/pubs/html/04231305/04231305.htm* | 0423–1305 | SDTDC | 07/04 |
| Anchoring Trail Markers and Signs in Rocky Areas (by L'Tanga Watson) | 0423–1307 | SDTDC | 10/04 |
| Camera with Altitude for Wilderness Site Monitoring (by Mary Ann Davies) *http://fsweb.mtdc.wo.fs.fed.us/pubs/htmlpubs/htm04232301* | 0423–2301 | MTDC | 04/04 |
| Advanced Tree Climbing and Rigging Training for Trail Workers (by Susan Jenkins, Ian Barlow, and Bob Beckley) *http://fsweb.mtdc.wo.fs.fed.us/pubs/htmlpubs/htm04232303* | 0423–2303 | MTDC | 03/04 |

| Title | Number | Source | Date |
|---|---|---|---|
| What's Burning in Your Campfire? Garbage In, Toxics Out (by Mary Ann Davies) *http://fsweb.mtdc.wo.fs.fed.us/pubs/pdfpubs/pdf04232327/pdf04232327dpi300.pdf* | 0423–2327 | MTDC | 09/04 |
| An Improved Method For Collecting and Monitoring Pine Oleoresin (by Dick Karsky, Brian Strom, and Harold W. Thistle) *http://fsweb.mtdc.wo.fs.fed.us/pubs/pdfpubs/pdf04342306/pdf04342306dpi300.pdf* | 0434–2306 | MTDC | 04/04 |
| Water Rakes (by Rich Robertson) *http://fsweb.sdtdc.wo.fs.fed.us/pubs/html/04511306/04511306.html* | 0451–1306 | SDTDC | 07/04 |
| Sediment Measurements from Multiple Aggregate Sources: Not All Aggregates Perform The Same (by Randy Foltz and Mark Truebe) | 0451–1308 | SDTDC | 08/04 |
| Biodiesel Fuel Use in Diesel Engines (by Ron Tam) *http://www.fs.fed.us/eng/pubs/html/04511309/04511309.html* | 0451–1309 | SDTDC | 09/04 |
| New Headlamp for Wildland Firefighters (by Dennis Davis) *http://fsweb.mtdc.wo.fs.fed.us/pubs/htmlpubs/htm04512317* | 0451–2317 | MTDC | 06/04 |

| Title | Number | Source | Date |
|---|---|---|---|
| Improved Face and Neck Shroud for Wildland Firefighters (by Lori Messenger and Tony Petrilli) *http://fsweb.mtdc.wo.fs.fed.us/pubs/htmlpubs/htm04512323* | 0451–2323 | MTDC | 06/04 |
| Inspecting, Cleaning, Repairing, and Retiring USDA Forest Service Chain Saw Chaps (by Lori Messenger and Tony Petrilli) *http://fsweb.mtdc.wo.fs.fed.us/pubs/htmlpubs/htm04512324* | 0451–2324 | MTDC | 06/04 |
| Comparing Four Methods of Correcting GPS Data: DGPS, WAAS, L-Band, and Postprocessing (by Dick Karsky) *http://fsweb.mtdc.wo.fs.fed.us/pubs/pdfpubs/pdf04712307/pdf04712307dpi300.pdf* | 0471–2307 | MTDC | 07/04 |
| Controlling Rodents in Forest Service Facilities: Reports from the Field (by Kathleen Snodgrass) (electronic only) *http://fsweb.mtdc.wo.fs.fed.us/pubs/htmlpubs/htm04712332* | 0471–2332 | MTDC | 07/04 |
| Maintenance Issues and Repair Guidelines for Precast Concrete Toilets and Buildings (by Gary Kees) *http://fsweb.mtdc.wo.fs.fed.us/pubs/pdfpubs/pdf04712334/pdf04712334dpi300.pdf* | 0471–2334 | MTDC | 09/04 |

| Title | Number | Source | Date |
|---|---|---|---|
| Shredding Small Trees to Create Mulch for Erosion Control (by James Scott Groenier) *http://fsweb.mtdc.wo.fs.fed.us/pubs/pdfpubs/pdf04712335/pdf04712335dpi300.pdf* | 0471–2335 | MTDC | 09/04 |

## SPECIAL REPORTS

| Title | Number | Source | Date |
|---|---|---|---|
| Timber Damage by Black Bears: Approaches to Control the Problem (by Dale L. Nolte, Kimberly K. Wagner, and Andy Trent) *http://fsweb.mtdc.wo.fs.fed.us/pubs/htmlpubs/htm03242832* | 0324–2832 | MTDC | 11/03 |
| Air Program News: Issue 4 (by Andy Trent) (electronic only) *http://fsweb.mtdc.wo.fs.fed.us/pubs/htmlpubs/htm03252820* | 0325–2820 | MTDC | 05/03 |
| Laboratory Evaluation of Real-Time Smoke Particulate Monitors (by Andy Trent) *http://fsweb.mtdc.wo.fs.fed.us/pubs/pdfpubs/pdf03252834/pdf03252834dpi72.pdf* | 0325–2834 | MTDC | 12/03 |
| Asphalt Paving of Treated Timber Bridge Decks (by Merv Eriksson, Homer Wheeler, and Sharon Kosmalski) *http://fsweb.mtdc.wo.fs.fed.us/pubs/htmlpubs/htm03712809* | 0371–2809 | MTDC | 11/03 |

| Title | Number | Source | Date |
|---|---|---|---|
| Backcountry Road Maintenance and Weed Management (by Leslie Ferguson, Lacey Celestine, and Kathleen Snodgrass) *http://fsweb.mtdc.wo.fs.fed.us/pubs/htmlpubs/htm03712811* | 0371–2811 | MTDC | 07/03 |
| 2002 MTDC Documents (by Amy Oravetz and Cailen Hegman) *http://fsweb.mtdc.wo.fs.fed.us/php/library_card.php?p_num=0371%202831* | 0371–2831 | MTDC | |
| T&D News: Number 3, 2003 (by Bill Kilroy and Jerry Taylor Wolf) *http://fsweb.mtdc.wo.fs.fed.us/pubs/htmlpubs/htm03712841* | 0371–2841 | MTDC | 12/03 |
| Riparian Restoration (by Ellen Eubanks) | 0423–1201 | SDTDC | 08/04 |
| Recreation Newsletter (by SDTDC Recreation staff) | 0423–1802 | SDTDC | 04/04 |
| Trail Construction and Maintenance Notebook: 2004 Edition (by Woody Hesselbarth and Brian Vachowski) *http://fsweb.mtdc.wo.fs.fed.us/pubs/htmlpubs/htm04232825* | 0423–2825P | MTDC | 04/04 |
| Air Program News: Issue 5 (by Andy Trent) (electronic only) *http://fsweb.mtdc.wo.fs.fed.us/pubs/htmlpubs/htm04252808* | 0425–2808 | MTDC | 03/04 |

| Title | Number | Source | Date |
|---|---|---|---|
| MTDC Portable Vehicle Washer (by Andy Trent, Dick Karsky, Chuck Harding, and Scott Gilmour) *http://fsweb.mtdc.wo.fs.fed.us/pubs/pdfpubs/pdf04342819/pdf04342819dpi72.pdf* | 0434–2819 | MTDC | 07/04 |
| MTDC Portable Vehicle Washer System: Operator's Manual (by Andy Trent, Dick Karsky, Chuck Harding, and Scott Gilmour) (electronic only) *http://fsweb.mtdc.wo.fs.fed.us/pubs/pdfpubs/pdf04342826/pdf04342826dpi72.pdf* | 0434–2826 | MTDC | 07/04 |
| Interagency Retardant Base Planning Guide (by the National Wildfire Coordinating Group Interagency Committee) | 0451–1803 | SDTDC | 09/04 |
| Wildland Firefighter Health & Safety Report: No. 8. (by Brian Sharkey) *http://fsweb.mtdc.wo.fs.fed.us/pubs/pdfpubs/pdf04512802/pdf04512802dpi72.pdf* | 0451–2802 | MTDC | 05/05 |
| El refugio de proteccion nueva generacion (by Leslie Anderson) *http://fsweb.mtdc.wo.fs.fed.us/pubs/htmlpubs/htm04512831* | 0451–2831 | MTDC | 05/04 |

| Title | Number | Source | Date |
|---|---|---|---|
| How to Conduct Drop Tests of Aerial Retardant Delivery Systems (by Greg Lovellette) (electronic only) *http://fsweb.mtdc.wo.fs.fed.us/pubs/pdfpubs/pdf04572813/pdf04572813dpi300.pdf* | 0457–2813 | MTDC | 07/04 |
| Everyday Hazmat User's Training Guide (by J. Craig Erickson, William H. McMullen, and Wes Throop) (electronic only) *http://fsweb.mtdc.wo.fs.fed.us/pubs/pdfpubs/pdf04712810/pdf04712810dpi300.pdf* | 0471–2810 | MTDC | 09/04 |
| New From MTDC: 2003 (by Jerry Taylor Wolf) *http://fsweb.mtdc.wo.fs.fed.us/php/library_card.php?p_num=0471%202820* | 0471–2820 | MTDC | 09/04 |
| T&D News: Number 1, 2004 (by Bill Kilroy and Jerry Taylor Wolf) *http://fsweb.mtdc.wo.fs.fed.us/pubs/htmlpubs/htm04712828* | 0471–2828 | MTDC | 05/04 |

## Videotapes (VHS), Compact Disks (CD), Digital Video Disks (DVD), Web Sites, and PowerPoint Presentations

| Title | Number | Source | Date |
|---|---|---|---|
| Work Capacity Test Administrator's Guide (by Chuck Whitlock) CD | 0351–2C01 | MTDC | 04/03 |
| Occupational Safety & Health Training for Supervisors and Managers (by Chuck Whitlock) CD *http://fsweb.mtdc.wo.fs.fed.us/pubs/ppt_html/htm03672C09* | 0367–2C09 | MTDC | 12/03 |
| Construction of Precast Concrete Outhouses (by Gary Kees and Ted Cote) PowerPoint Presentation *http://fsweb.mtdc.wo.fs.fed.us/pubs/ppt_html/htm04232P01* | 0423–2P01 | MTDC | 08/04 |
| National Snow Load Information (by James Scott Groenier) Web site *http://fsweb.mtdc.wo.fs.fed.us/snow_load* | 0423–2W02 | MTDC | 06/04 |