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Cutting Boundary Agreements

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Introduction

Property boundary lines between public lands administered by the Forest Service and privately owned lands have provided some interesting problems. Generally, the problems stem from differences of opinion about the actual location of a boundary. In theory, the boundary is simply a straight line between adjacent corners of the original Government survey, providing the land has always been public. This is true no matter how far out of the proper mathematical position these original corners might be. This principle is very practical. Homesteaders (or, for that matter, the Rangers listing a Forest Entry Homestead) should be able to rely on a physical monument in locating themselves. They should not have to survey to verify the location of every parcel.

For the most part, it is possible to recover these original corners, and some Forest Service people have become quite uncanny at locating trees marked by the original Government surveyors 100 to more than 300 years ago. Often, the original work was done under economic and other pressures, and it is not uncommon for trees that were called pines to actually be oaks, with distances and bearings differing substantially from the records of the original surveyors. Nonetheless, these corners are, when they were set, found far more often than not. They are then used in establishing Forest property boundary lines. Because of common law and case law precedents, these boundaries with found original corners rarely create dissension.

When the position of one or more of these original corners is lost by logging, fire, road construction, or simply time erasing the corner evidence, the problem becomes more complex, and survey judgments, which can be subjective, open the possibility for boundary uncertainties. Because measurements are required to reestablish these lost corners and because no one can produce a measurement that is absolute, measuring can always be questioned. Moreover, the resurvey (to reset a corner) does not and indeed cannot claim to have placed the original corner precisely where the original surveyor placed it. Because the corner thus set is not the original, it is forever open to question.

This is particularly true concerning public lands. Boundary disputes between individual landowners can be settled by agreement between themselves, but only Congress can agree on the boundaries of public lands. (Congress has delegated to the Forest Service some limited and definite authorities in the "Small Tracts Act.") Fortunately, even when it is necessary to reset a corner by survey measurement, generally the distances rarely exceed 1 mile, and any distortion or irregularity remains fairly local and small.

Fraudulent Original Surveys

Another entirely unforeseen problem is when fraud has occurred in the original survey. The United States issued patents to private owners based on nonexistent original surveys. "Interesting" does not accurately describe the problems that arise. Fraudulent original surveys are found in at least 10 Western States.

The Bureau of Land Management (BLM), as the direct descendant of the General Land Office (GLO), has been given the sole authority to survey the boundaries of public lands. It was the intent of the statutes creating the rectangular survey system that Federal surveyors would conduct the original surveys and local surveyors would complete any necessary subdivision work. But when the original survey was not done, only the BLM Cadastral Survey Section has the authority to declare an original survey fraudulent. Normally, some rather vigorous retracement surveys are done before a survey is declared a fraud.

The bulk of fraudulent original surveys, at least in the West, were the result of the Special Deposit Amendment to the Homestead Act, and while this era of fraud lasted about 3 years (1879–1882), it is estimated that about 10 to 15 percent of the original surveys in the mountains of 10 Western States are affected. In California alone, this means about 800 townships. Consequently, without hiring enormous numbers of surveyors, solving the Federal property line problems may require nearly 200 years.

Private landowners, however, cannot afford the economic patience that this two-century wait requires. Consequently, all sorts of creative approaches have been used, many intended to be temporary, to solve boundary line problems in these areas.

On occasion, private land surveyors were hired to provide lines of occupation primarily based on patented area and U.S. Geological Survey (USGS) quad sheet protractions. Some landowners simply have expanded their occupation outward from a central position, until the public land managers called them to account. Some even knew of the fraud and would occupy public lands in fraudulent areas, knowing the Federal Government had no original corners or enough survey funds to legally stop them.

The Birth of the Cutting Boundary Document

Another more scrupulous method came about in the late 1940's. At that time, the Southern Pacific Railroad Company asked the Forest Service to establish agreement lines for the purpose of timber cutting. The company had completed a four-decade appraisal and timber cruise, which had included a search for property corners to define the areas to be appraised. They had already begun logging in areas where the original survey was faithfully done and wished to begin harvesting in areas of extensive fraud. So they initiated an informal cutting boundary document, which reflected the knowledge that:

(1) Complete legal retracements and dependent resurveys were prohibitively expensive.

(2) No one in the Forest Service had the authority to agree on permanent binding property boundary lines.

(3) The protractions of the township and section line on the USGS quadrangles probably were the best available guess as to where the legal property lines might be.

(4) Without some form of agreement, trespass revealed by the inevitable legal survey would be in multiples of the actual timber value. The language of the cutting agreement limited damages to actual value at the time of cutting.

(5) The Federal Government, in issuing patent to the land, had guaranteed the original survey. The survey was necessary to describe the title to the lands given up by the Government.

(6) Until an eventual Government resurvey (whose cost would be assumed by an unspecified entity) was done, the "cutting boundary monuments" would be used. They would be superseded by the official resurvey, and an adjustment then would be made.

This began a trend. Because these cutting boundary monuments solved immediate property boundary problems in townships, they began to be applied on portions of townships and eventually were used even to subdivide single sections where all the original exterior corners were in place. While this was not necessarily a logical progression, it certainly was a predictable one; traditionally, no funds were allocated for legal boundary work.

These informal agreements were used in California at least (Mississippi footnote), and some of the resulting monuments have been in place for 40 years. Because these monuments are the only available practical control, are usually obvious, and are set by the Federal Government, their history of use has grown geometrically. Lands have been subdivided and sold based on these locations, and indeed millions of board feet of timber have been cut and miles of road have been built based on their positions. On occasion, the Government has even condemned land under the principle of eminent domain using agreement corners.

The Shasta-Trinity Effort

Finally, about 1977, funds and a formal program for marking and posting boundaries came to California. At this point, no new cutting boundary agreements were allowed. Simply forbidding new cutting boundary agreements did not halt timber sales in fraudulent townships, however. Land managers, denied the use of agreement corners, were given waivers to harvest timber inside whatever arbitrary boundaries they might select. The Forest Service was forced to gamble that any litigation or claims would be economically tolerable. Because of the number of miles of boundary and the areas of fraud, these waivers are still required on the Shasta-Trinity and perhaps other Forests as well.

The Resource Protection Act of 1976 legally required that all boundary lines between public and private lands be located and marked and posted to standard by the year 2010. Consequently, the methods for resolving this legacy of cutting boundaries have to be developed in a cost-effective and equitable fashion.

The Shasta-Trinity Forests began a resolution effort in T. 35 N., R. 6 W., M.D.M.—a more or less typical cutting boundary township. Only two original GLO interior corners had been found, and only five exterior corners were found in the township out of the 130 or so ones that were allegedly set. Documented search efforts extend back to 1910. No fire, land movement, or other history explains this extensive obliteration.

This township is one of forty Special Deposit townships allegedly done by Deputy Surveyor N.L. Berdan under a contract with GLO. Deputy Berdan was one of the Special Deposit surveyors indicted in 1887 for survey fraud. According to his field note record, Deputy Berdan and three helpers surveyed the 3,000-mile boundary, setting the 5,200 corners for 40 townships in a single year. This works out to more than 8 miles per day during a 365-day year, at elevations ranging from 2,000 to 6,000 feet, with chest deep snow 4 months of the year in the higher ground.

Because of this lack of original corner recovery and because Southern Pacific wished to cut trees that were being lost to age and disease, a cutting boundary agreement was begun. The approximate locations of the section corners were developed using a multiscope, which allowed the superimposition of the section lines from a standard USGS quad sheet onto a 9-inch by 9-inch format project photograph. The section corner locations were pinpricked on adjacent photograph pairs to ensure stereo coverage. These photographs were then taken into the field. The approximate proper ground position was determined from the photographs, and a monument consisting of a 1-inch-diameter by 24-inch-long galvanized iron pipe with a 2 1/2-inch brass cap was set firmly in the ground. Where possible, four reference trees were tagged with aluminum signs giving a bearing and distance from the tree to the cutting boundary monument. The brass cap also was stamped "cutting boundary monument."

These monuments were set at nominal 1-mile increments throughout the township. A cutting boundary monument was set at what is probably the only original corner at what would be the 10, 11, 14, and 15 section corner. The marked trees at this location "ring count" to the 19th century, but the GLO field notes indicate that no trees were available. With the monuments set, a private land surveyor blazed and painted the boundary lines between the cutting boundary monuments.

Once this was completed, management of the lands began in earnest. Road building with rights-of-way and haul costs, timber harvest plans, environmental impact statements, and all the necessary activities associated with timber harvest were done. A further complication resulted from the gold dredging rush that began in the late 1970's, and claims were filed using the cutting boundary lines as defining the lands open to mining.

The Forests proposed a 70-million-board-foot timber sale in the township in 1980, and the affected Ranger Districts requested a legal resolution of the township. Because this clearly was an area of extensive fraud, the Forests contacted the BLM State Office Cadastral Survey Section and asked that special instructions be issued to the Forests under the memorandum of understanding that allows Forest Service surveyors to conduct land surveys under Federal authority.

The special instructions were issued to conduct a dependent resurvey of the township exterior. Supplemental instructions allowed for an investigative survey of the interior of the township using analytic photogrammetry. The Forests chose photogrammetry because of work force restrictions and cost effectiveness.

The township exterior work and the control survey were done under contract with private land surveyors. Target placement was done by Forest Service crews augmented by two temporary BLM crews that were waiting for a project helicopter.

The targets were removed soon after placement by a number of black bears in the area, who were even reluctant to wait until the project had been flown. (This problem required several trips into a number of target areas. This repetition was later avoided in an adjacent township by placing small open plastic containers of ammonia near the targets—recommended by Tim Burton, a biologist-bear expert. The method was 100-percent successful and eliminated what was becoming a hobby for the bears.)

The project was flown under a contract to a private firm with the resulting analytic values developed with the Regional Geometronics staff using their Kern Monocomparator and a mainframe bundle adjustment program. The largest residual was less than seven-tenths of a foot, resulting in a precision error ratio for the worst section closure of 1 part in 13,000.

The technical aspect of the project had satisfied our specified closure of 1 part in 5,000. However, where Federal boundaries are concerned, technical precision is not nearly as important as adherence to legal procedures. It was not enough to be accurate; the lines had to be legally correct.

The question now became whether to treat the resurvey effort as a dependent resurvey (treat the missing fraudulent corners as being lost rather than never set) or an independent resurvey (recognize fraud or gross distortion and cancel portions or all of a township and set tract corners in place of the corners of the original survey). Again, only BLM can conduct an independent resurvey, having the sole authority to cancel an original survey.

The township ownership patterns are perhaps nearly typical of a railroad grant township. The only private ownership other than the lands of Southern Pacific was a 40-acre parcel in section 16 and the State of California and a lumber company each owning half of section 36. Sections 16 and 36 were granted to California on its admission to statehood.

The "1973 BLM Manual of Surveying Instructions" addresses resurvey issues in Chapter 6, particularly pages 6–15 through 6–50. It became quite difficult to resolve what survey procedures could be justified given the conditions of the township (for example, fraud in the original survey, the ownership patterns where many section lines were property boundary lines, and the use of the cutting boundary corners).

No precedent was discovered. Consequently, many alternatives had to be examined so that one might be found that would be acceptable to BLM, the private landowners, and the Forest Service.

A dependent resurvey of the interior was not possible because of the costs involved. The resurvey costs, including moving the corners at 1-mile intervals and setting the intervening one-quarter corners at half-mile intervals, was estimated at about $75,000. However, the lost timber values from the resulting gores and overlaps and unmanageable strips would be in excess of $700,000. Administrative costs also included a 100-percent stump cruise, the changing of unpatented mining claim boundaries, and the recomputing of road rights-of-way and maintenance costs.

The major private landowner, Southern Pacific, had already invested $25,000 in setting the boundary cutting corners as well as sharing the $60,000 invested in the dependent resurvey of the township exteriors and the analytic photogrammetric resurvey of the interior. The company was not willing to share or carry any further expense. The Forests simply did not have a budget or the people to perform a dependent resurvey.

Working closely with the BLM State Office, we developed some compromises in procedures. Essentially, this involved the acceptance of the cutting boundary agreement monuments as "the best available evidence of the original survey," eliminating the need for remonumentation or re-marking of the monument caps, and avoiding any break in the chain of title for private landowners. This saves taxpayers at least $700,000 in timber, time, and administrative costs (excluding possible litigation costs).

The affected private landowners agreed on these procedures (in writing). This should provide insurance against future landowners disputing the survey.

Fence Brace Designs

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Horizontal Braces

Corner, line, gate, and fence end braces are an important part of any fence. When using high-tensile smooth wire for a fence, braces are even more important because to be effective, the entire fence must be maintained at the recommended tension. In recent years, the horizontal fence brace (figure 1) and the double horizontal fence brace (figure 2) have been accepted as the standard and strongest fence brace design. These braces are efficient; however, there are other brace designs that are as good or better and cost less for materials and installation.

Even the cost of a double horizontal fence brace can be lowered by using a single, longer horizontal brace. Calculations show that on a 4-foot-high

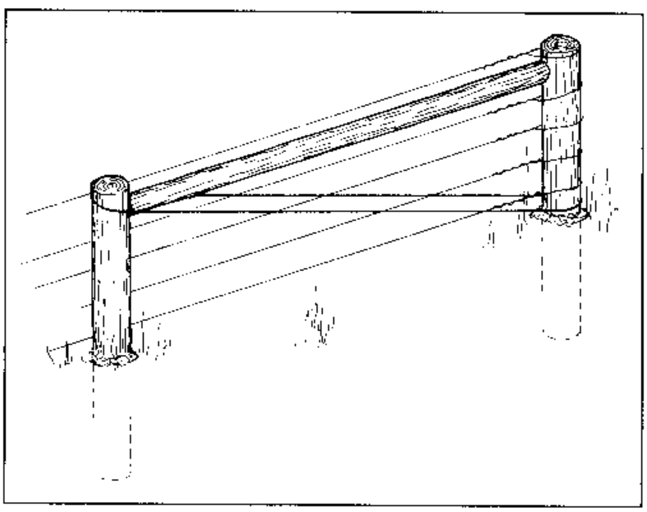

Figure 1.—Horizontal fence brace.

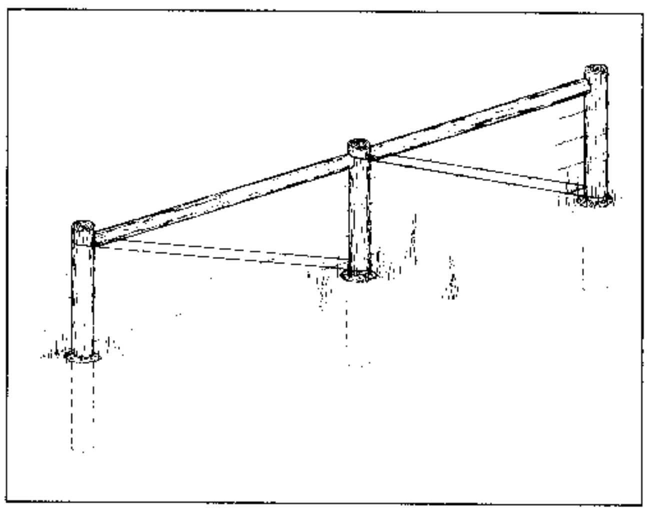

Figure 2.—Double horizontal fence brace.

fence, a single-panel horizontal fence brace 11 feet long is as good or better than a 16-foot double horizontal fence brace constructed from two 8-foot panels.

Diagonal Braces

The diagonal brace (figure 3) is structurally equal to the horizontal fence brace, but it costs less because one less hole must be dug, one less post must be purchased, and no measuring or fitting is required to install it. When used on a 4-foot-high fence, a single diagonal brace, 11 feet long along the ground, is equal or better than a double-panel horizontal fence brace 16 feet long. A diagonal fence brace is equal in strength and holding force to a horizontal brace because it has the same lifting force on the corner post and the same soil reaction forces as a horizontal brace of the same size (that is, length of brace on the ground).

When designing and installing a diagonal brace, three principles should be considered. First, make the diagonal brace (or horizontal brace) as long as possible—up to about 11 feet along the ground for a 4-foot-high fence. This is approximately 5.5 times the average wire height. Extending a diagonal beyond 11 feet for a 4-foot-high fence is not necessary.

Second, be sure that the ground-contact end of the diagonal brace is free to move in the direction of the fence pull; it must not be blocked by a stake or fence post. When the end of the diagonal bears against a stake or fence post and is not free to move, one-half to two-thirds of the total fence tension can

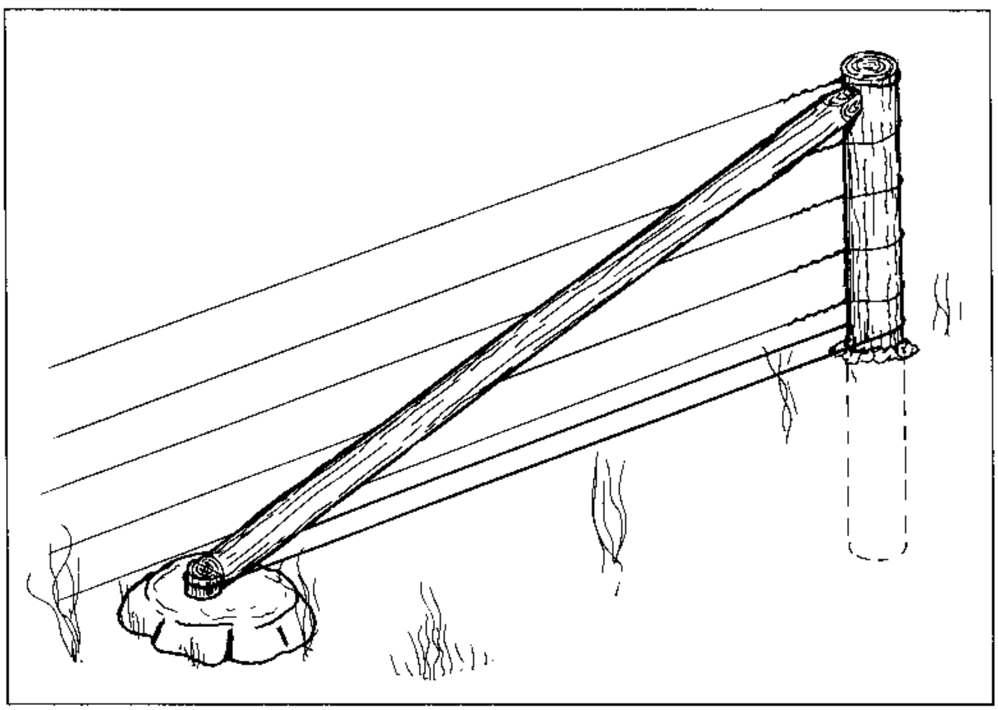

Figure 3.—Diagonal fence brace.

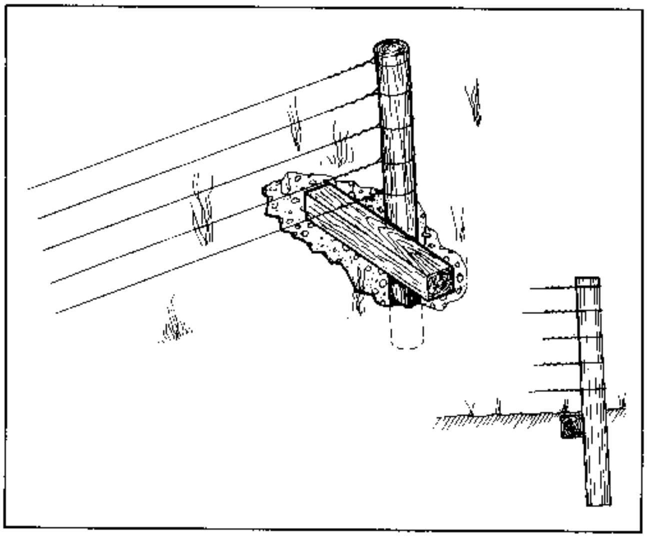

Figure 4.—Block fence brace.

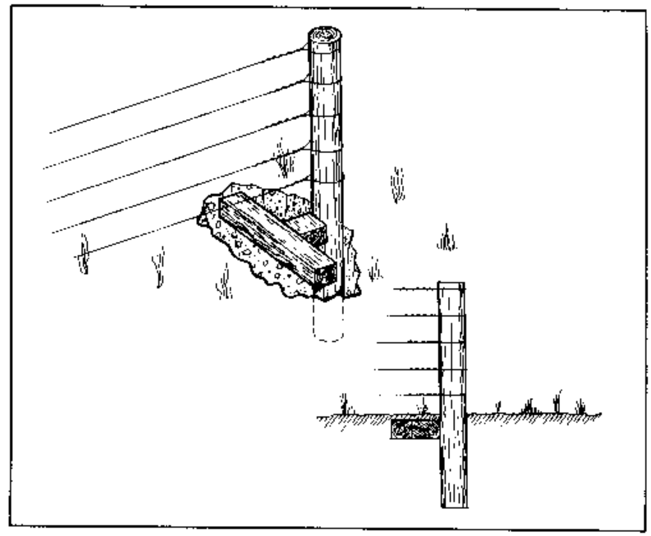

Figure 5.—Block fence brace with compression spacer.

be transmitted to the blocking stake or fence post. This greatly reduces the ability of the corner post of the brace to resist pullout (failure).

Third, the diagonal brace can bear against the corner post in any location from the middle of the post to the top. However, the top is probably best. The maximum bending moment of the corner post (the load or forces trying to break the post by bending it, located at ground level where the brace wire is attached to the corner post) is the same whether the diagonal brace bears against the top or the middle of the corner post. However, when the diagonal brace bears against the middle of the corner post, the loading in the brace (compression) and lower brace wire (tension) will be twice that of a diagonal brace bearing against the top of the corner post.

Block Braces

The block brace (figure 4) is another good brace. It is very simple, low cost, and easy to install—but where and when to use it requires skill and judgment. The block brace uses a single post with a block just below ground level to reduce soil bearing loads to acceptable limits. The bearing area of the block must be large enough to reduce the soil loading to a level that the soil can carry over a long time without movement, even under heavy moisture conditions. The maximum bending moment of the vertical post of the block brace is approximately the same as that of the horizontal or diagonal fence brace and is located in the same place—at ground level.

The block brace works well in heavy soils and will work well in lighter soils if the block is made large enough. Also, the block brace works best if the block is wedged in place and the block presses against undisturbed soil. If the block is loose, a compression spacer can be wedged between the post and the block to tighten the block against undisturbed soil. The block brace can also be strengthened by setting the post down to 36 inches or more and by cutting a wedge out of the block to help hold the post upright. The block can be any size or shape, provided it is large enough. Blocks can be 6- by 6-inch wood blocks, large rocks, a small amount of concrete, or concrete bars (such as those used for car stops).

The block can be placed away from the post with a compression spacer between the post and block (figure 5). This compression spacer can be as long as necessary—6 to 8 feet, or even longer. Like the diagonal brace, the block brace can be used effectively at dog legs or 90-degree corners to keep the post from pulling over (figure 6). The block brace has a major advantage over the horizontal or diagonal brace in that there is no force trying to lift the post out of the ground.

Summary

Horizontal and diagonal fence braces are equal in strength and holding power. For a 4-foot-high fence, a single horizontal or diagonal fence brace 11 feet long is equal to a double horizontal fence brace 16 feet long.

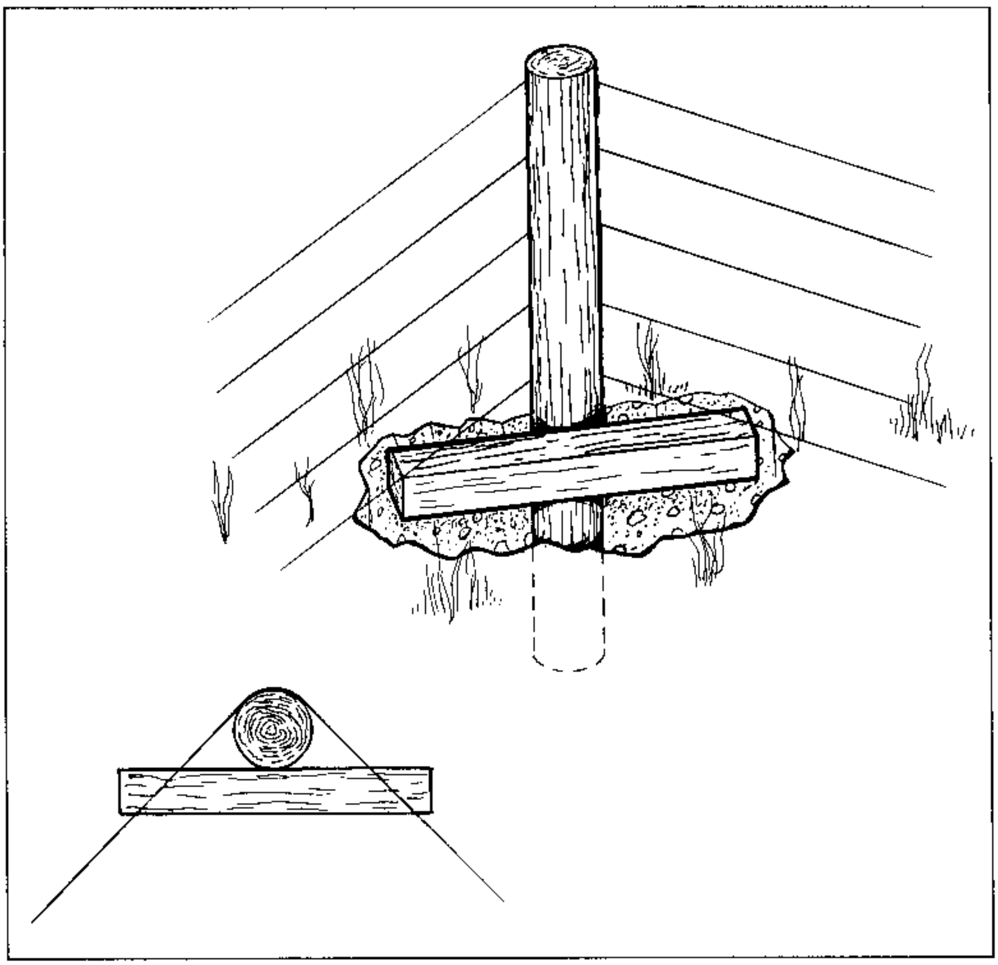

Figure 6.—Block fence brace used at a dog leg or 90-degree corner.

Three principles guide the design and installation of diagonal fence braces:

(1) Make the diagonal (or horizontal) brace as long as possible.

(2) Be sure that the ground-contact end of the diagonal is free to move in the direction of fence pull and is not blocked by a stake or fence post. *This is important!*

(3) Place the diagonal brace against the corner post at any point from the middle to the top of the post.

The block brace is an efficient, low-cost, easy-to-install, and simple brace, but it requires knowledge and judgment in where and how to use it.

The Forest Service Roofing Technology Seminar: An Opportunity To Get on Top of Your Roofing Problems

George J. Lippert
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Washington Office Engineering

Introduction

Facilities Engineers and Architects need a solid understanding of roofing materials and systems and roof inspection and management (*1*). However, comprehensive training on roofing is limited. Roofing materials manufacturers offer training, but these sessions are sometimes biased by company interests.

The Forest Service established and tested a continuing opportunity for facilities staff to become more skilled in this area. During the spring and summer of 1989, the Forest Service Roofing Technology Seminar began with the help of the Roofing Industry Educational Institute (RIEI) staff, headquartered in Englewood, Colorado.

The seminar is designed to meet both Forest Service and individual skill needs. It covers watershedding, water-repelling, and waterproofing; insulation and fasteners; speciality, spray-on foam; steep, shingle-type roofs; low-sloped, membrane roofs; built-up roofs and single-ply membranes; and metal roofs. Inspection, repair, maintenance, long-term roofing management, and reroofing also are covered in depth.

Description of RIEI & the Seminar

RIEI (rye-eye) is a nonprofit educational corporation, chartered in Colorado, serving all with a professional interest in roofing technology. Since 1979, RIEI has provided an extensive number of 1- to 4-day courses throughout the United States on specific roofing topics and issues. As an educational institute, RIEI has a board of regents, representing a broad spectrum of the roofing industry, research engineers, and consultants, for oversight of program quality and maintenance of state-of-the-art information. RIEI also has an extensive, part-time faculty of experts to augment their knowledgeable staff with speciality courses and other matters. In addition to public courses, RIEI provides in-house training to a number of clients, from General Motors to the U.S. Postal Service. For the past 3 years, the Postal Service has contracted over 30 weeks of training per year for its maintenance mechanics and first-line supervisors—15 students at a time. Thus, scheduling seminars is becoming increasingly difficult.

Trainees studying roofing inspection problems using a story board.

The association with RIEI has met and exceeded Forest Service expectations. Continually on the "lookout" for high-quality training in facilities-related skills, I contacted a number of associates regarding roofing training possibilities before selecting RIEI. As part of my position in the Washington Office, I am a member of several interagency committees and am a Policy Subcommittee member of the Federal Roofing Committee. RIEI was strongly endorsed by members of the Committee. Forest Service personnel who have taken RIEI courses provided some feedback as well. Additionally, I attended RIEI's roofing inspection, maintenance, and repair course 3 years ago. I was impressed. RIEI's quality and variety of training programs, breadth and depth of knowledge on roofing systems, and, in particular, unbiased discussion of competing materials and systems offer Forest Service personnel the best training on roofing.

Because RIEI has an array of "on-the-shelf" roofing training sessions, reference materials, and training aids, the Forest Service elected to combine parts of three RIEI courses into a 4 1/2-day session. This kept development costs down and held overall costs of the session to almost half that of separate courses. RIEI's training facility in Englewood, a Denver suburb, is a central location for most Forest Service personnel.

The seminar had two stages: a "paper" (development) stage and an "acid test" before a critical audience. Designing the seminar was a challenge, considering the variety of roofing systems in the Forest Service; steep, shingle roofs are dominant, but the Forest Service has almost every type of roof and roofing system commercially available.

The course also was designed not only to meet roofing situations and skill gaps, but to provide for individual professional development. More and more, technical support is shared between Research and National Forests and among Forests. With promotions, transfers, and new facilities as variables, facilities managers can expect a variety of roofing situations.

The acid test session of the seminar was held February 26 to March 2, 1990. Twenty-seven people attended, including Regional, Forest, and Station architects, facilities engineers, engineering technicians, and maintenance mechanics. Both new and experienced personnel participated. Approximately one-third were architects, one-third were professional facilities engineers, and one-third were technicians. Frankly, I was somewhat skeptical about the seminar reaching such a spectrum of interests and backgrounds; however, as I read the critique sheets during the course and later, it became clear that the seminar was a real "winner." The skill need, session appeal, and quality of technical presentations, combined with sufficient time for questions and answers, blended to produce a high-quality training session. The critiques helped to fine-tune the curriculum and to reduce its length for a Friday noon closing.

Instructor Brad Raleigh discussing built-up roofing practices.

Other Seminars

As a result of need, quality of training, and cost-effectiveness, the Forest Service has scheduled two similar seminars for this coming winter. They will be held January 14 to 18, 1991, and March 4 to 8, 1991. Both sessions will be held at the Radisson Hotel (Denver South) in Englewood, Colorado, near RIEI's headquarters. Tuition is $650 per person. Attendance is open to all Forest Service facilities personnel but is limited to 35 per session.

The second seminar was scheduled to provide attendees the opportunity to also attend the International Conference of Building Officials (ICBO) Education Institute. This program, which is not sponsored by the Forest Service, will be held the week of February 25, 1991, at the Sheraton Hotel (Denver Technology Center) in Englewood. The Sheraton is about 2 miles from the Radisson.

The Institute is operated annually by the Colorado Chapter of ICBO. The Institute has become popular with facilities personnel seeking training in the ICBO series of codes (the Uniform Building Code, the Uniform Fire Code, the Uniform Mechanical Code, and the Uniform Housing Code). Concurrent and repeated sessions offer a wide choice of specific lectures. The classes are designed for new and experienced building officials and inspectors from municipalities and counties as well as for architects, contractors, construction engineers, and other facilities personnel.

Forest Service attendance has been growing steadily for the past 4 years. In 1989, 32 facilities personnel representing 6 Regions and 14 Forests participated. Last year's tuition was $250 for the week. Specific information for the 1991 Institute will be available around January 1. For more information about the Institute, contact Dave Faulk or Thad Schroeder, Region 2 Engineering.

Conclusion

The roofing seminar is a cost-effective training opportunity. When the cost of replacing a roof is compared with the savings brought about by prudent roof management (inspection, preventive maintenance, and timely repairs), tuition, travel, and salary costs more than pay for themselves. Jim Holbrook, Engineering Technician, Southeastern Station, sent me a note shortly after the most recent seminar. By modifying a planned reroofing project, he saved more than the entire cost of the seminar for all those who attended.

Rather than supply a series of complimentary quotes and highlights from the critique sheets, this article includes a list of those who attended the latest session (see the box). I encourage anyone interested to consult them about the seminar.

The Forest Service plans to continue working with RIEI, scheduling a seminar or two each year for the foreseeable future. During the next 5 to 6 years, I hope that all facilities staff will attend a Forest Service Roofing Technology Seminar. Forest Service facilities will be in better hands with personnel who apply these new skills. The seminar provides a good foundation for successful roof management and for working effectively with roofing consultants and contractors.

Forest Service Roofing Technology Seminar

Participant List—February 26 to March 2, 1990
Roofing Industry Educational Institute, Englewood, Colorado

Region 1	Oswaldo Mino, Staff Architect, Regional Office, Missoula, Montana Meno Troyer, Engineering Technician, Spotted Bear Ranger Station, Flathead National Forest, Kalispel, Montana
Region 2	Bill Martin, Staff Engineer, Regional Office, Lakewood, Colorado Dave Saunders, Engineering Technician, Nebraska National Forest, Chadron, Nebraska Al Svoboda, Engineering Technician, Black Hills National Forest, Custer, South Dakota Jeff Frank, Engineering Technician, San Juan National Forest, Durango, Colorado Thad Schroeder, Staff Architect, Regional Office, Lakewood, Colorado Mike Fortner, Engineering Technician, Nebraska National Forest, Chadron, Nebraska Dave Faulk, Regional Architect, Regional Office, Lakewood, Colorado Jack Infanger, Civil Engineer, White River National Forest, Glenwood Springs, Colorado
Region 3	Kathryn Davenport, Engineering Technician, Coronado National Forest, Tucson, Arizona Kurt Kretvix, Staff Architect, Regions 2, 3, and 4, Regional Office, Albuquerque, New Mexico Shannon Clark, Facilities Engineer, Coconino National Forest, Flagstaff, Arizona
Region 4	Wilden W. Moffett, Regional Architect, Regional Office, Ogden, Utah Ken L. Page, Regional Facilities Program Assistant, Regional Office, Ogden, Utah
Region 5	Pamela O. Chang, Staff Architect, Regional Office, San Francisco, California
Region 6	Joe Mastrandrea, Regional Architect, Regional Office, Portland Oregon Jo Ann Simpson, Staff Architect, Regional Office, Portland, Oregon
Region 10	Joe Kennedy, Civil Engineer, Tongass National Forest, Chatham Area, Sitka, Alaska
Intermountain Station	Vic Hager, Engineering Technician, Moscow, Idaho
Northeastern Station	Cleve Biller, Station Facilities Engineer, Morgantown, West Virginia
Southeastern Station	Jim Holbrook, Engineering Technician, Asheville, North Carolina
Southern Station	Darryl Landau, Engineering Technician, New Orleans, Louisiana
Forest Products Laboratory	Gerald Campbell, Facilities Manager, Madison, Wisconsin
Washington Office	George Lippert, Chief Facilities Engineer, Washington, D.C.

For more information, contact your Regional or Station Facilities Engineering Staff or the author (DG is G.LIPPERT:WO1A).

Reference

1. USDA Forest Service. 1989 (May). *Facilities Management Skill Requirements* (EM 7310-6). Washington, DC: USDA Forest Service.

Law: Standards of Care

Norman Coplan
Partner
Bernstein, Weiss, Coplan, Weinstein & Lake
New York City

In most jurisdictions the common law requires architects to perform with a degree of care and competence that is consistent with the prevailing standards of the profession in the same geographical area and at the same time. As knowledge progressively increases, the standard by which architects' performance is measured will change. Performance that might have satisfied the prevailing standard in 1960 may be unacceptable in 1990. If architects were to be judged by the prevailing standards of the profession at the time of the claim, rather than at the date of performance, the design professions would be at serious risk.

This role was challenged in a Federal court case (*Barnett* v. *Board of Education of the City of Yonkers, et al.*), which involved an asbestos-related death. The American Institute of Architects and The New York State Association of Architects, alarmed by the potentially devastating consequences for the profession if the traditional rule were modified, intervened in the case as a "friend of the court" and filed an amicus brief in support of the architect.

The action was for a wrongful death, where the plaintiff alleged that the deceased was exposed to friable asbestos while a student in high school in Yonkers, New York, between 1967 and 1970. The suit was instituted against the Yonkers school board, who in turn impleaded the architect who had designed the school in 1959, alleging that he was negligent in specifying asbestos products. The school board asked for indemnification or a contribution from the architect.

The intervention of the American Institute of Architects and The New York State Association of Architects was successful because, on a motion for summary judgment, the cross-claim against the architect was dismissed. In its opinion the court stated:

> Absence an express warranty of specific results, an architect may only be held liable in malpractice for the negligent performance of his professional services. Unlike the Board which had an ongoing responsibility to maintain the school in a safe condition, (the architect's) duty to exercise reasonable care in rendering his services ended in 1959 with the completion of his performance. Thus (the architect's) performance must be examined under the standards of the architectural profession in 1959. Like other professionals, the architect must ply his trade with a degree of care and competence generally expected of a reasonably skilled

> member of his profession in the same geographical area at the same time. The record lacks any evidence that the use of asbestos in school building construction was inconsistent with the generally accepted practices of the architectural profession through 1959. (The architect) could not reasonably have been expected to know of the deleterious effects of asbestos between 1956 and 1959.

The Yonkers school board had also contended in this case that if the architect was not subject to a claim of negligence, he might be liable to the owner for breach of implied warranty or strict liability. The doctrine of implied warranty suggests that the architect implicitly promised the owner that his design of the project would result in a safe building and that, therefore, he should be required to indemnify the owner of his breach of contract. The doctrine of strict liability suggests that the architect is a guarantor of the safety of the building and that apart from negligence, he is liable to the owner if the building is not in fact safe for its inhabitants. The Federal court, however, rejected this approach stating that, "New York law is crystal clear that in service-oriented contracts, such as agreements to render architectural services, no action in breach of implied warranty or strict product liability will lie" independent of a claim for negligent performance of professional services.

The school board also sought to obtain summary judgment against the plaintiff and to dismiss the complaint, contending that when the deceased attended high school, the board had no knowledge, constructive or otherwise, that asbestos created a danger for those who might come into contact with it. The board argued that in the 1950s and 1960s the use of sprayed-on asbestos was prevalent in school buildings, and, therefore, the board could not reasonably have known of the dangers associated with asbestos. The plaintiff on the other hand submitted 14 articles published in newspapers and magazines in the 1960s suggesting there might be a link between asbestos and the development of cancer in individuals exposed to it. The court, in rejecting the school board's motion, pointed out that portions of the school's ceilings had deteriorated to an alarming degree while the deceased was a student and the board knew that portions of these crumbling ceilings contained asbestos.

If the school board appeals the decision of the Federal Trial Court, it may contend that even if the architect had not been negligent when performing his services, he had a duty to advise his client of the dangers of asbestos contained in its building at the time he acquired knowledge of the hazard, even though it was several years after the completion of his performance. Again, if such a rule was proposed, it should concern the architectural profession and call for further intervention by the professional associations.

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Monitoring Subgrade Frost Penetration Using Constant Data Loggers With Thermistor Installations

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Background

Thermistors are temperature-sensitive resistors whose resistance changes predictably with temperature fluctuations. Assembled in strings that are installed vertically beneath road surfaces, thermistors are used to monitor subgrade frost penetration so that managers can predict when roads may become thaw-weakened. Their use was first developed and tested on the Kootenai National Forest and is now widespread in Regions 1 and 6.

Thaw-weakening is the loss in load-supporting capacity of a pavement resulting from melting ice in the pavement's base, subbase, or subgrade materials. Melting ice leaves the expanded soil in an underconsolidated condition, which may allow excess pore water pressure to build up. Water released when ice melts from the surface downward cannot drain through the still-frozen subgrade. Base and subbase courses may become completely saturated, or even over-saturated, if they are inadequately drained or blocked under still-frozen shoulders. This condition substantially reduces the pavement's bearing capacity, increases frost effects in subsequent freeze-cycles, pumps water and fines through cracks, and accelerates surface fatigue cracking and pothole formation. The degree of surface-strength loss depends on soil type, temperature conditions, traffic, rainfall during the previous fall and winter, spring rainfall, drainage, and atmospheric humidity (*1*). In some areas, there may be only one period of thaw-weakening, beginning with the general rise of air temperatures in the spring. In other locations, several significant periods may occur during a winter season.

Temperature monitoring with thermistors solves only part of the puzzle. Common practice has been to set road and load restrictions during spring thaw. Timing of the restrictions has been based on the experience of local maintenance personnel and on visual indicators of damage. However, by the time one can see road damage caused by spring thaw, irreversible facility damage has already occurred. Further, drivers often complain that road and load restriction warnings are not timely, that condition evaluations are subjective, and that the restrictions are premature. Temperature data derived from the thermistor network in a road system, combined with surfacing deflection data, allow managers to restrict loads and close roads only during the critical periods of thaw-weakening. User complaints were reduced after Forest personnel explained the program to drivers and showed them the testing information.

Use of Data Loggers

Thermistor strings have evolved through several phases since they were first used on the Kootenai National Forest. Working with Gordon Hanek, Geotechnical Engineer on the Olympic National Forest, Forest Service personnel have made several design changes during the last 6 years. The resultant product is a durable, weathertight, easily installed field unit.

The success of a thermistor monitoring program depends on the frequency with which temperature readings are taken. (It is also important to establish that a thaw-weakened condition can exist at a selected site.) If the monitoring frequency is not great enough or if monitoring is interrupted, as it is during severe weather, a site's critical period may be missed. Also, random individual readings do not show the daily heat-flow patterns through the road structure. However, these difficulties can be overcome by logging data automatically. Therefore, the Umpqua National Forest searched for a data logger that was compatible with instrumentation already installed and that was versatile, reliable, and easy to use. The OmniData Easy Logger has met all expectations.

Connection of a Thermistor String to the OmniData Easy Logger

The thermistor strings were originally designed to be read with a handheld temperature meter. However, the strings can be wired to a data logger for automatic readings. Because the thermistor temperature probe sends a resistance-varying signal and most data loggers record voltage-varying signals, some wiring modification is needed. Figure 1 is a complete wiring schematic for the probe-logger interface (3). The Easy Logger expects an input signal of 0 to 5 volts. It has a reference voltage source of 5.00 volts (called "+5V Excitation") that can be used to power external sensors such as the thermistor probe.

A simple half-bridge circuit converts the resistance-varying output of the thermistor string to a voltage-varying signal that the Easy Logger can sense (4). The half-bridge consists of a precision resistor wired in series with each thermistor in the string.

Each thermistor changes resistance as the temperature changes, but the half-bridge resistors do not. Each thermistor-resistor pair forms a voltage divider, and the Easy Logger records that divided voltage. The formula for calculating the resistance of the thermistor from the sensed voltage at the logger is $R = (5.00/v)(4{,}990) - 4{,}990$, where v is the sensed voltage, R is the thermistor resistance, the applied voltage is 5.00 volts, and the bridge resistance is 4,990 ohms (3). For example, suppose the thermistor is at a temperature such that its resistance is 4,990 ohms. In this case, both the thermistor and half-bridge resistances are the same so the voltage recorded by the Easy Logger will be one-half of 5.00 volts, or 2.50 volts. If the thermistor resistance goes up to 6,000 ohms, then the voltage recorded by the Easy Logger will be $5.00(4{,}990)/(4{,}990 + 6{,}000)$, or 2.27 volts.

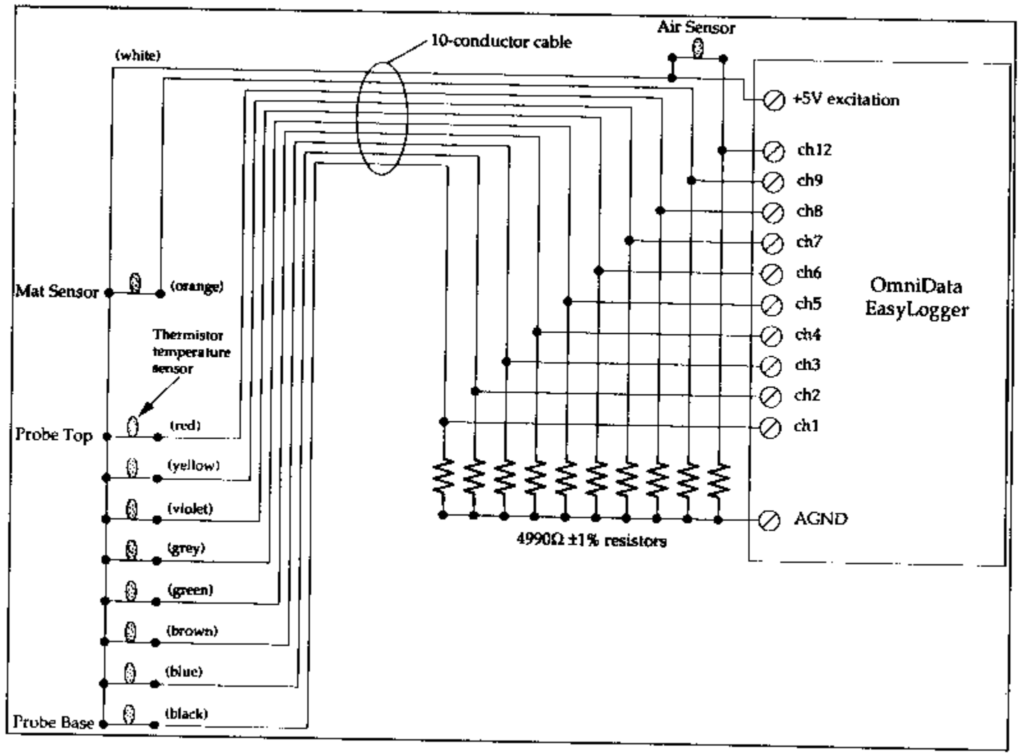

Figure 1.—Complete wiring schematic for the probe-logger interface.

Used with the Yellow Springs Instrument Company (YSI) 44004 model thermistors in a temperature probe, bridge resistors of 5,000 to 7,500 ohms yield a measuring range of –30 to +50 °C. To obtain a theoretical precision of ± 0.1 °C, the bridge resistors should be ± 0.1 percent, 50 ppm or better resistors and the thermistors' (guaranteed accurate to ± 0.2 °C by YSI) individual calibrations must be checked (4). The Forest used 1.0-percent precision resistors in the first thermistor string/data logger hookups and achieved a temperature monitoring accuracy of ± 0.5 °C. Tests have shown that the freeze/thaw point of most soils is approximately –0.11 °C. Thus, to accurately determine whether a frozen state exists within the road structure, a temperature measuring accuracy of at least ± 0.06 °C is needed, and constructing the bridge with 0.1-percent precision resistors is recommended (1).

Working out the particulars of the half-bridge construction solved the thermistor string-Easy Logger interface problems. The next step was to determine the formula for calculating the temperature from the sensor reading.

Development of the Sensor Function

The Easy Logger will gather data at any scan interval from 0 to 1,440 minutes (24 hours) and report that information at any integral multiple of the scan interval. (The Forest opted to have each sensor scanned every 10 minutes and the average of those values recorded every 30 minutes.) Each time the Easy Logger reads a sensor, it performs a set function on that reading to convert the reading to the desired information. The user enters conversion functions into the Easy Logger beforehand, according to the type of probe attached to the Easy Logger. Functions are provided for OmniData probes, but Forest personnel had to determine the resistance-to-temperature function for the thermistor probe.

Forest personnel contacted OmniData International's Research and Development section and, working with one of their engineers, developed the formulas needed to generate the function. Using the table of values of resistance versus temperature provided by YSI with the thermistors, the following formula was generated (4):

$$T = 1/(a + b(\ln(R)) + c((\ln(R))^3)) - 273.15$$

where T = temperature (°C)
a = 0.001464462
b = 0.000238863
c = 0.000000099
R = thermistor resistance (ohms)

When choosing calibration temperatures, make sure that they can be easily verified by independent measurement and that they span the range over which one plans to measure in the field. Forest personnel measured the voltage across the bridge element at –13 °C, 2 °C, and 25 °C. The calibration curve will be the best fit over the range of these three calibration points. The slope of the calibration curve is the function that is used as the sensor conversion formula to generate temperature readings in degrees Celsius.

The Celsius scale was used so that freezing temperatures are obvious when visually checking the reports and when graphing temperature data. The negative sign is easy to see on the reports, and negative temperatures plot below the freezing axis on graphs. Figure 2 is an example of a report generated directly from the Easy Logger. Figure 3 is a temperature graph based on Easy Logger data.

As determined by testing, the following functions should be entered into the Easy Logger for conversion of thermistor resistance measurements to temperatures (2):

(1) NATLN=LN(24950/V–4990)

(2) A=.001464462

(3) B=.000238863

(4) C=.000000099

(5) CONVRT=1/(A+B*NATLN+C*NATLN^3)–273.15

LOCATION: MP 8.7 RD 29 SCAN INTERVAL: 10 MINUTES
OPERATOR: REPORT INTERVAL: 30 MINUTES
REPORT: 1 START WHEN?:
STOP WHEN?:

	TEMP1 PAVEMNT DEG C INST	TEMP2 TOP DEG C INST	TEMP3 DEG C INST	TEMP4 DEG C INST	TEMP5 DEG C INST	TEMP6 DEG C INST	TEMP7 DEG C INST	TEMP8 DEG C INST	TEMP9 BOTTOM DEG C INST	AIR TEMP DEG C INST
12/26 10:07	-3.9	-2.6	-0.6	1.2	3.0	4.4	5.9	7.2	8.2	-2.7
12/26 10:37	-3.9	-2.6	-0.6	1.2	2.9	4.4	5.9	7.2	8.2	-2.7
12/26 11:07	-3.9	-2.6	-0.6	1.2	2.9	4.4	5.9	7.2	8.2	-2.6
12/26 11:37	-3.8	-2.6	-0.6	1.2	2.9	4.4	5.9	7.2	8.2	-2.4
12/26 12:07	-3.7	-2.6	-0.6	1.2	2.9	4.4	5.9	7.2	8.2	-2.2
12/26 12:37	-3.7	-2.6	-0.6	1.2	2.9	4.4	5.9	7.2	8.1	-2.0
12/26 13:07	-3.6	-2.6	-0.6	1.2	2.9	4.4	5.9	7.2	8.1	-1.8
12/26 13:37	-3.5	-2.5	-0.6	1.2	5.9	4.4	5.9	7.2	8.1	-1.7
12/26 14:07	-3.3	-2.5	-0.6	1.2	2.9	4.4	5.9	7.2	8.1	-1.6
12/26 14:37	-3.2	-2.4	-0.7	1.2	2.9	4.4	5.9	7.2	8.1	-1.5
12/26 15:07	-3.1	-2.4	-0.7	1.1	2.9	4.4	5.9	7.2	8.1	-1.3
12/26 15:37	-3.0	-2.3	-0.7	1.1	2.9	4.4	5.9	7.2	8.1	-1.3
12/26 16:07	-3.0	-2.3	-0.7	1.1	2.9	4.4	5.9	7.2	8.1	-1.2
12/26 16:37	-2.9	-2.3	-0.7	1.1	2.9	4.4	5.9	7.2	8.1	-1.2
12/26 17:07	-2.9	-2.2	-0.7	1.1	2.9	4.4	5.9	7.2	8.1	-1.3
12/26 17:37	-2.9	-2.2	-0.7	1.1	2.9	4.3	5.9	7.2	8.1	-1.3
12/26 18:07	-2.9	-2.2	-0.7	1.1	2.9	4.3	5.9	7.2	8.1	-1.4
12/26 18:37	-2.9	-2.2	-0.7	1.1	2.9	4.3	5.9	7.2	8.1	-1.4
12/26 19:07	-2.9	-2.2	-0.7	1.1	2.9	4.3	5.9	7.2	8.1	-1.4
12/26 19:37	-2.9	-2.2	-0.7	1.1	2.9	4.3	5.9	7.2	8.1	-1.4
12/26 20:07	-2.9	-2.2	-0.7	1.1	2.9	4.3	5.9	7.2	8.1	-1.6
12/26 20:37	-3.0	-2.2	-0.7	1.1	2.9	4.3	5.9	7.2	8.1	-1.6
12/26 21:07	-3.0	-2.2	-0.7	1.1	2.9	4.3	5.9	7.2	8.1	-1.6
12/26 21:37	-3.0	-2.2	-0.7	1.1	2.9	4.3	5.9	7.2	8.1	-1.7
12/26 22:07	-3.0	-2.2	-0.7	1.1	2.9	4.3	5.9	7.2	8.1	-1.8
12/26 22:37	-3.0	-2.2	-0.7	1.1	2.9	4.3	5.9	7.2	8.1	-1.8
12/26 23:07	-3.1	-2.2	-0.7	1.1	2.9	4.3	5.9	7.2	8.1	-1.9
12/26 23:37	-3.1	-2.2	-0.7	1.0	2.9	4.3	5.9	7.2	8.1	-2.0
12/27 00:07	-3.1	-2.2	-0.8	1.0	2.9	4.3	5.9	7.2	8.1	-2.0
12/27 00:37	-3.2	-2.2	-0.8	1.0	2.8	4.3	5.9	7.2	8.1	-2.1
12/27 01:07	-3.2	-2.3	-0.8	1.0	2.8	4.3	5.9	7.2	8.1	-2.1
12/27 01:37	-3.3	-2.3	-0.8	1.0	2.8	4.3	5.9	7.2	8.1	-2.2
12/27 02:07	-3.4	-2.3	-0.8	1.0	2.8	4.3	5.9	7.2	8.1	-2.3
12/27 02:37	-3.4	-2.4	-0.8	1.0	2.8	4.3	5.8	7.2	8.1	-2.4
12/27 03:07	-3.5	-2.4	-0.8	1.0	2.8	4.3	5.8	7.2	8.1	-2.4
12/27 03:37	-3.5	-2.4	-0.8	1.0	2.8	4.3	5.8	7.1	8.1	-2.5
12/27 04:07	-3.6	-2.5	-0.8	1.0	2.8	4.3	5.8	7.1	8.1	-2.6
12/27 04:37	-3.6	-2.5	-0.8	1.0	2.8	4.3	5.8	7.1	8.1	-2.6
12/27 05:07	-3.7	-2.5	-0.8	1.0	2.8	4.3	5.8	7.1	8.1	-2.6
12/27 05:37	-3.7	-2.6	-0.8	1.0	2.8	4.3	5.8	7.1	8.1	-2.7
12/27 06:07	-3.8	-2.6	-0.8	1.0	2.8	4.3	5.8	7.1	8.1	-2.8
12/27 06:37	-3.9	-2.6	-0.8	1.0	2.8	4.3	5.8	7.1	8.1	-2.9
12/27 07:07	-3.9	-2.7	-0.8	1.0	2.8	4.3	5.8	7.1	8.1	-3.0
12/27 07:37	-4.0	-2.7	-0.9	1.0	2.8	4.3	5.8	7.1	8.1	-2.9
12/27 08:07	-4.0	-2.7	-0.9	1.0	2.8	4.3	5.8	7.1	8.1	-2.9

Figure 2.—Report produced by the OmniData Easy Logger.

Conclusions

The OmniData Easy Logger works well as a multichannel data recorder when used in conjunction with the Forest Service subsurface temperature probe. The Umpqua Forest operated two of these units from October 1989 through April 1990. Data acquisition was interrupted only by operator error. One unit worked flawlessly even when it was half-submerged in water. Once the Easy Logger's operation is mastered, the unit is user friendly. It is important to set aside one OmniData E-Prom Data Storage Pack as a master copy of the Easy Logger setups. If an operator accidently removes the unit's memory, the master E-Prom Data Storage Pack can be installed and the system quickly brought back into operation. As an alternative to hand-programming the individual units and other Forests' units, the Umpqua National Forest's master E-Prom could be used to download the setups into other units. The setup can be cloned from one of the Umpqua's Easy Loggers to other Forests' master E-Prom Data Storage Packs.

There are other applications for the thermistor string/Easy Logger marriage. Because the thermistor string assembly is completely watertight, it can be

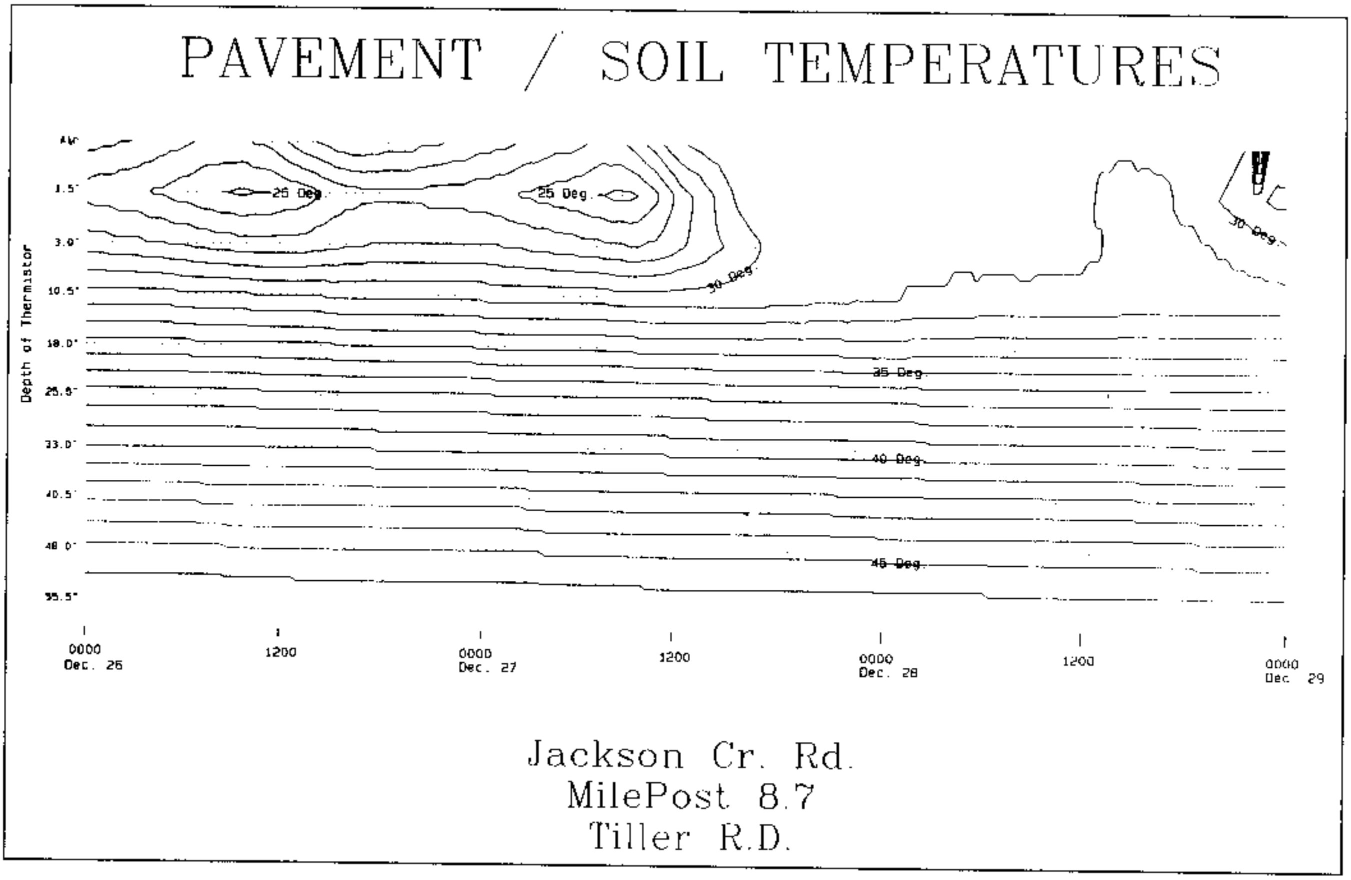

Figure 3.—Temperature graph based on Easy Logger data.

modified for use in water temperature studies, using the Easy Logger to record the data. Soil temperature studies could also benefit from this technology. Besides temperature probes, one could also attach the Easy Logger to other instruments such as rain gauges, slope movement indicators, strain gauges, and so forth. As long as the probe generates either a voltage or resistance fluctuation and a sensor conversion function can be determined, the Easy Logger should be able to handle it. An example of such an application is to have, at one site, a subsurface thermistor installation, a rain gauge, and soil moisture sensors. As long as there are no more than 12 sensors at one site, the OmniData Easy Logger can be programmed to monitor the various sensors.

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United States Holocaust Memorial Museum, Washington, D.C.

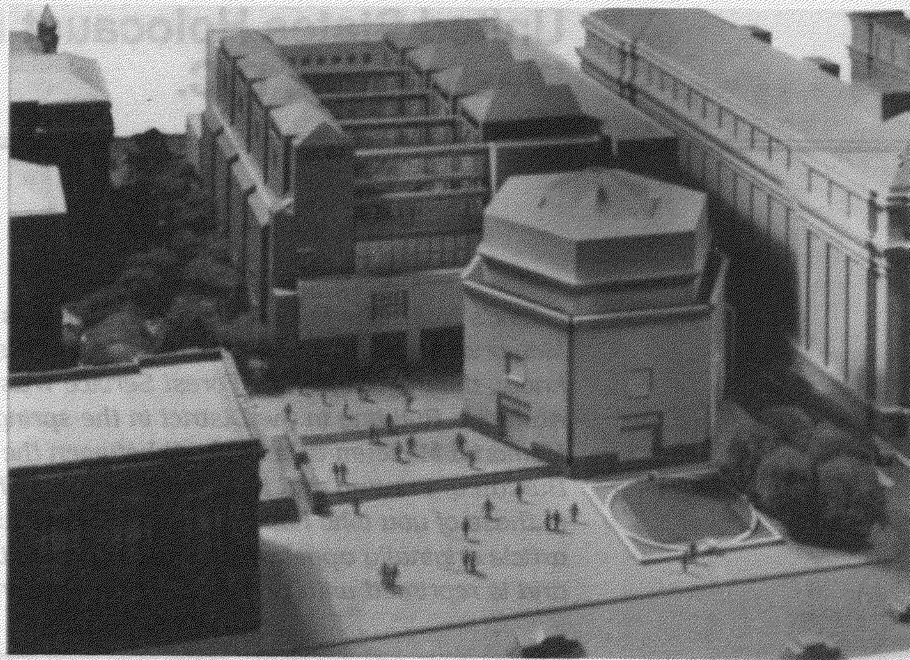
Editor's Note: The following article discusses the United States Holocaust Memorial Museum under construction in Washington, DC. As most of you know, the majority of the Forest Service Washington Office moved to the Auditor's Building in the District in the spring of 1990. The Holocaust Memorial Museum is being built between the Auditor's Building and the Bureau of Printing and Engraving. We thought the article might be of interest to those of you who have witnessed or are witnessing the construction. The article originally appeared in the May 1990 issue of Progressive Architecture *and is reprinted with permission from Penton Publishing.*

Just as confronting the reality of the Holocaust has contributed to a rethinking of art, philosophy, and even architecture, the prospect of a Holocaust Museum required—or permitted—a different approach to museum design. James Ingo Freed of Pei Cobb Freed & Partners, however, eschewed the Deconstructivist expressions of confusion and uncertainty that have been linked to postwar anguish over the Holocaust, choosing instead a solemn building that somewhat disturbingly echoes the forms and materials of the Nazi concentration camps.

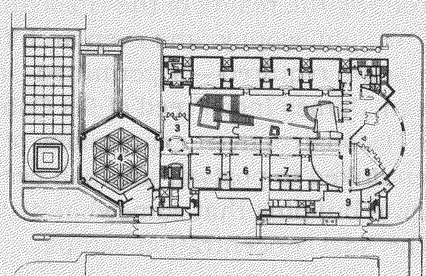
The building functions foremost as a memorial; only 23 percent of its area is actually given over to exhibition space. Because of its prominent site near Washington's Mall, the building has a somewhat Classical visage; the eight pyramidally topped towers, though, intentionally recall the towers of the concentration camps.

Inside, the plan centers on the three-story Hall of Witness, a long, skylighted room whose granite west wall is rent by a large crack. One of the boldest allusions is in the Hall's north wall, where the brick wall, steel strapping, and arched openings are meant to recall death camp ovens. At the west end is a hexagonal volume that houses the Hall of Remembrance and, below, a theater.

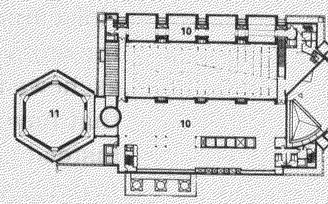
Other functions contained in the museum are a library, research facility, and education center. Construction began last year; the building should be complete in 1992.



VIEW FROM 15TH STREET

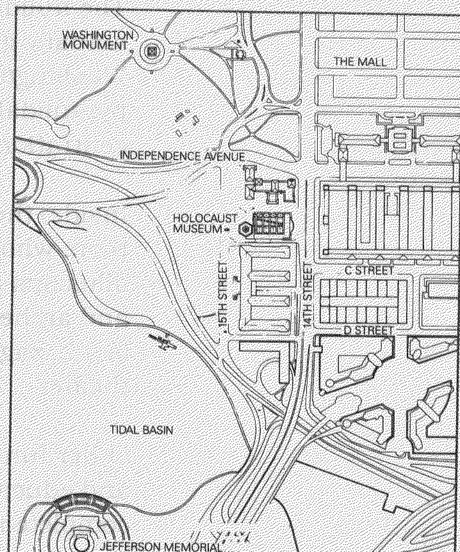


FIRST FLOOR PLAN N ↑ 100'/30m



THIRD FLOOR PLAN

HALL OF WITNESS



SITE PLAN N ↑ 400'/120m

United States Holocaust Memorial Museum.

Bibliography of Washington Office Engineering & Technology & Development Publications

This bibliography contains information on publications produced by the Washington Office Engineering Publications Section and the Technology & Development Centers located in Missoula, Montana, and San Dimas, California. The listing is arranged by publication series and 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 20, November-December 1989). Copies of *Engineering Field Notes*, *Technology & Development News*, Engineering Management Series, and other publications listed herein are available to Forest Service personnel through the Engineering Staff Technical Information Center (TIC). Copies of "Project Reports," "Equip Tips," and "Special & Other Reports" are available from the Technology & Development Center that is listed as the source.

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Engineering Field Notes

This publication is a bimonthly periodical that supplies the latest technical and administrative engineering information and ideas related to forestry and provides a forum for the exchange of such information among Forest Service personnel.

EFN by Title

1989 *Engineering Field Notes* Article Awards	Editor. EFN 22 (January-February 1990): 1–4.
Awards for the 1989 *Engineering* Field Notes Articles	Editor. EFN 22 (July-August 1990): 3–4.
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Bridge Design Ethics	Keeley, James W. EFN 22 (March-April 1990): 1–9.
Bridge End Fill Repair	Johnson, Jim. EFN 22 (July-August 1990): 3–4.
Control for Block Analytical Photogrammetry at GSC	Valentine, Wayne H. EFN 22 (May-June 1990): 35–40.
Cutting Boundary Agreements	Fields, Jim (Deceased). EFN 22 (November-December 1990): 1–6.
Cutting Boundary Agreements	Harmon, Donna. EFN 22 (November-December 1990): 1–6.
Data Needs for Strategic & Project GIS	Valentine, Wayne H. EFN 22 (May-June 1990): 1–5.
Designed Natural-Appearing Cement Structures for Wet Area Enhancement	Streeper, Richard J. EFN 22 (July-August 1990): 15–21.
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Fence Brace Designs	McKenzie, Dan W. EFN 22 (November-December 1990): 7–11.
Fence Brace Designs	White, Jeffrey. EFN 22 (November-December 1990): 7–11.

(The) Forest Service Roofing Technology Seminar: An Opportunity To Get on Top of Your Roofing Problems	Lippert, George J. EFN 22 (November-December 1990): 13–18.
Getting There & Back—A New Perspective	Bowser, Jerry. EFN 22 (September-October 1990): 23–26.
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Hells Canyon Boat Dock on the Snake River	Mahugh, G. Irvin. EFN 22 (January-February 1990): 33–43.
Law: Standards of Care	Coplan, Norman. EFN 22 (November-December 1990): 19–20.
(The) LEGIS Program: A Personal Narrative	Bowser, Jerry. EFN 22 (January-February 1990): 5–8.
Monitoring Subgrade Frost Penetration Using Constant Data Loggers With Thermistor Installations	Baichtal, James F. EFN 22 (November-December 1990): 21–27.
NAD-27 Versus NAD-83	Hedman, Vic. EFN 22 (March-April 1990): 31–33.
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***National Fire Equipment System (NFES) publications must be purchased from the Boise Interagency Fire Center (BIFC), BLM Warehouse Supply; 3905 Vista Avenue, Boise, ID 83705.

“Getting There and Back” Lapel Button

We have designed a button for our “Getting There and Back” information campaign. It is the result of the assistance of the USDA Design Division. You will quickly note that it does not say “Getting There and Back.” We were advised by experts that “Getting There” is a nice *internal* saying for those who know what we mean. They advised that we be less subtle. Responding to that counsel, the finished product reads: “Get Inside the Great Outdoors . . . Access to Your National Forests.” The design also incorporates the logo that will be used on all “Getting There and Back” products.

The objective of the button is to remind the wearer or an observer that access is essential to the use and enjoyment of the National Forests. It represents a concept of quality management of access to serve the outdoor recreationist, the hunter, the fisher—the public in general. The button also reminds us about the need for ways into large blocks of National Forests currently unavailable because of a lack of public access across private holdings.

If you would like a button, please contact Jerry Bowser, Washington Office Engineering, DG at WO1A or FTS 453-9436.

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