Technology for Alaskan Transportation

Winter 1988 - Volume 10
University of Alaska Fairbanks
Alaska Transportation Technology Transfer Program

In This Issue

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How to Reduce the Cost of New Bridges

The Alaskan economy is struggling through hard times, and Alaska's transportation agencies are feeling the crunch as well. Pennsylvania faced similar financial problems in 1980, and one of their solutions could save money in Alaska. Pennsylvania's Department of Transportation (PennDOT) found that they could dramatically reduce the cost of building new bridges by allowing contractors to submit their own alternative designs when bidding on new bridge construction. This saved big bucks without sacrificing safety, load capacity or durability.

PennDOT got the idea from the Federal Highway Administration which, in 1979, recommended obtaining bids for alternative designs (one steel, the other concrete) for major federal-aid bridges. The goal was to foster competition among contractors and perhaps save more money than the additional engineering fees that would be required.

On major bridges (over $5 million), PennDOT provides plans for an "as designed" steel bridge structure and an "as designed" prestressed concrete bridge, with designs created by consultants or PennDOT staff. However, only one design is prepared for nonmajor bridges. Prospective contractors can bid on these designs or present their own alternative design in steel, concrete, or a combination of both.

PennDOT is obligated to select the project with the lowest bid. If the successful bidder uses an alternative, a

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Being a Professional Engineer in Government

Here are some tips for engineers who work for local government from Herb Klossner, the director of transportation for Hennepin County, Minnesota.

Professional engineering in government can, at times, be difficult. It is difficult because engineering and politics don't mix. Engineering is an exact science dealing with absolutes like mathematics, physical laws, industry standards, and so forth. Politicians hate all those things and can't understand why anything has to be absolute. I think the hardest part for a professional working in government is that we are sometimes put in compromising positions where we see no compromise. The secret, which comes with experience, is to avoid being put into a compromising position. There are a few simple steps the professional can take to protect himself.

Don't play partisan politics. Avoid being labeled a Republican or a Democrat.

Give alternatives that are based on sound engineering judgement that you can live with. Politicians love alternatives. You can compromise your position, but never compromise your engineering judgement. If forced into a situation that you don't have control over, the best advice I can give is to

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Bridges
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conceptual design of the bridge must be submitted to PennDOT for approval within six calendar days of the contract award. If an acceptable alternative is not presented within 30 days, the contractor must build the "assigned" structure at no additional cost. In addition, the contractor must pay a share of PennDOT's review expense, based on the bridge's cost.

Now that the program has been operating eight years, several conclusions can be drawn. Although there was initial concern among engineers that owners would lose control over bridge appearance and safety, bridges built with alternate designs proposed by contractors still look like other bridges. Furthermore, these bridges meet the demanded load-carrying capacity with the required safety factor.

An analysis of all state bridge projects let to contract since adoption of the procedure indicates that 32 percent of major bridges (over $5 million) and 12 percent of nonmajor bridges are being built with contractor-designed alternatives.

In Pennsylvania, bridge costs dropped an average of 10 percent on major bridges and 7 percent on nonmajor bridges. Furthermore, once contractors gain experience with the procedure, they become adept at obtaining bridge contracts by using innovative fabrication and erection techniques and refined designs. Such a program also permits the steel and concrete industries to work closely with contractors in developing low-bid designs.

Computer-aided designs are assuming greater importance because of the limited time for presenting the initial conceptual design. In most cases, alternative bids came in below the "as designed" cost estimates. State-of-the-art technology, therefore, has been quickly introduced to the field of bridge engineering.

Unleashing creativity and allowing contractors to submit alternates seem to provide nothing but advantages to all concerned. Any program is well worth pursuing that encourages use of the latest technology for design and contruction to produce more cost-effective and innovative designs.

This article was adapted from a story that appeared in the September 1987 issue of *Public Works*.

Engineer
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keep accurate records and have good witnesses.

There is a change in attitude and a new movement in this country by the engineering profession and their societies. The professions are fighting back to regain some of the prestige that has been lost in recent years. This loss has been brought on by the public focus on structural failures, product recalls, nuclear power accidents, rocket malfunctions, whistle blowing, conflicts of interest, and controversies surrounding political contributions. In an attempt to address these concerns, the National Society of Professional Engineers is considering the formation of a national institute for engineering ethics. These same issues have prompted the American Society of Civil Engineers to produce a new manual entitled, *The Manual of Professional Practice for Quality in the Constructed Project*.

You must create this environment for change if you want progressive professional engineers on your staff. The accelerating tempo of change brought on by a fast-moving technology has placed all engineering departments under severe and increasing strain. Complex social issues, financial problems, population pressures, and increased services produce changing roles and situations that call for progressive engineers. We must recognize this need for a progressive engineering profession in order to solve the basic problems of poverty, hunger and ecology, and to help develop new technologies in areas such as solid waste disposal and transportation. In the hands and minds of progressive engineers, these are not problems but opportunities.

News & Views

Lasers Detect Needed Street Repairs

Lasers can help public works directors assess the need for street repairs. A Swedish-built machine uses lasers to measure the roughness, ruts, cracks, surface texture, and cross-profiles of pavements. By means of two microcomputers, the state-of-the-art road surface tester records data as minute as cracks a tenth the width of a fingernail.

In Oakland, California, the machine was used to test 822 miles of streets. Public works director Terry Roberts reports that it would have cost the city approximately $528,000 and have taken 13 persons one year to gather this data; the laser machine accomplished the task in two months for $187,000, as well as providing a scientifically objective record. The city leased the road surface tester from the Chicago firm of Novak, Dempsey & Associates, which holds the sole rights of its use in this country.

Unnecessary Signs

Obsolete and unnecessary signs confuse and annoy drivers. They can give a false sense of security, and they can breed a disrespect for all signs. Furthermore, the presence of unenforced signs creates disrespect for all signs. Perhaps the worst offender is the *Children at Play* sign. Local officials often face public pressure to install *Children at Play* signs. Although such signs have been posted widely in some communities, there is no evidence that they prevent injury of pedestrians or decrease the speed of vehicles.

Children at Play signs can give parents and children a false sense of security. Since nearly every residential block has children living on it, you would have to place a sign on each one. Blocks with no signs might imply to the driver that no children live there, so it is all right to speed. Children can interpret these signs to mean it is acceptable to play in the street, which is highly unsafe.

For these reasons, federal sign standards discourage the use of *Children at Play* signs. *Drive Carefully in School Zones* and *Slow Children* signs have also fallen out of favor for the same reason. However, you can and should post school zones, pedestrian crossings, playgrounds and other recreational areas. For more information on the proper use of signs, consult the *Manual on Uniform Traffic Control Devices*, which is published by the Federal Highway Administration. A copy of this manual is available for loan from the Alaska Transportation Technology Transfer Program.

Front-End Loaders

The front-end loader is one of the most used, most useful, and most dangerous pieces of equipment in road construction and maintenance.

In the mineral industry, accidents and fatalities involving the front-end loader lead those of all other types of equip-

(News & Views continued on page 3)

Alaskans Keep up Through Short Courses

How do you keep abreast of new ideas? Of course there are many different ways to accomplish this task, but it seems there is never enough time to keep up. Just think of the time you could save by assigning a particular subject area to someone else to research and present to you! Actually, this is one service the Alaska Transportation Technology Transfer Program provides by sponsoring courses.

We sponsor courses for the sole purpose of presenting useful information to you. We offer a wide variety of courses aimed at Alaska's diverse array of transportation professionals. Previous courses offered focused on real estate acquisition, pavement design, equipment and maintenance management, safety, and environmental issues, just to name a few.

This coming year we plan to offer courses on work zone traffic control, computer software applications, environmental audits, asphalt batch plant operations and pavement overlay design. More information on dates and locations of these courses will be provided in future newsletters.

Planning for future courses is a difficult task, and we could sure use your help. If you let us know what topics interest you, we will try to put a course together. We are also willing to repeat previous courses if a demand warrants. Just tell us your needs.

Even the most interesting and useful course would be difficult to attend if the price was too high. Therefore, we try to keep your participation affordable. Quite often the room rental and lunch expenses are all we ask of you; we pick up the cost of the instructor, materials and any additional fees. Of course, there are exceptions to this. Sometimes we are asked to sponsor a course that requires a higher fee than normal. When this happens, we must pass on some of the expense to you, but the course fee will still be quite reasonable.

Now that you know a little about our courses, we hope you will attend one. And if you feel that we are not covering a topic that is valuable to you or your fellow workers, let us know. We just might be able to help you out!

Previous Courses

Pavement Design Workshop
Highway Capacity and Quality Flow
Using the Urban Transportation Planning Process for Project Planning and Design
Real Estate Acquistion
Road Surface Management
Current Trends in Pavement Design
Backcalculation Procedures
Arterial Analysis
Environmental Impact Statement and Related Documents
Fundamentals and Abatement of Highway Traffic Noise
Local Agency Maintenance Management System
Local Agency Equipment Management System
The Use of Asphalt in Maintenance Activities
Safety Features for Local Roads and Streets
Safety Studies for Local Roads and Streets
Bridge Maintenance Training for Technicians
Bridge Maintenance Training for Supervisors
Design of Depressed Invert Culverts

THANKS, AL!

All good things must come to an end, and so it is with the participation of our editor, Al Paulson. From the first issue of our newsletter right on up to the one you are currently reading, Al has been the one primarily responsible for the quality newsletter you receive four times a year.

All of us at the Alaska Transportation Technology Transfer Program regard the quality of Al's work as excellent. He has created a newsletter standard that we are proud to claim. In fact, we feel it is so good, those of who are now charged with the newsletter responsibility are beginning to shake in our boots! We are going to miss his services, and wish him the very best!

News & Views
(continued from page 2)
ment. Statistics show that most accidents occur while the machine is backing. Most fatalities occur when the unloaded machine is being driven at high speeds from one area to another. This is especially dangerous because the front-end loader, when empty, tends to bounce and weave at high speeds. Down grades are also particularly hazardous due to the increased problems in controlling the vehicle.

Other hazards include collisions with other equipment while operating in congested areas, getting caught in the pinch points of the bucket arms or the articulated steering, and spilling parts of the load on the operator or others working in the area.

Technology for Alaskan Transportation is a quarterly newsletter that informs local transportation people in government and industry of useful publications and services. The newsletter reports on practical information, new technology, and learning opportunities such as workshops, seminars and videotapes. To get on our mailing list, to receive any of our services, or to contribute to the newsletter, contact:

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About Our Program

The goal of the Transportation Technology Transfer Program is to help local agencies obtain useful information and training related to transportation needs. The program focuses on technology related to roads, bridges and public transportation. In addition to our newsletter, we provide low-cost seminars and workshops, provide copies of useful technical reports upon request, and answer phone and mail inquiries related to transportation technology. If we don't have the answer, we will refer the question to a suitable specialist.

The Transportation Technology Transfer Program is administered by the Alaska Department of Transportation and Public Facilities, with principal support provided by the University of Alaska Fairbanks, Institute of Northern Engineering. This program is funded by the Federal Highway Administration, the University of Alaska Fairbanks (UAF), and the Alaska Department of Transportation and Public Facilities (DOT&PF).

The following people from DOT&PF and UAF are involved in the program.

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Calendar of Events

We will be happy to include any relevant event you would like to publicize. Call the editor at (907) 474-7733. For more information about events in Alaska, call Michael D. Travis at (907) 474-2482 or Michelle Johnson at (907)474-7733.

1989

January 19-21: Course 202, Interpersonal Relations in Roadway Acquisition. Fairbanks. Sponsored by the Arctic Trails Chapter 71, International Right of Way Association. Contact Sharon McLeod-Everette at 474-2414.

January 22-26: 68th Annual Meeting of the Transportation Research Board. Washington, DC. Call Marshall Thompson at (217) 333-3930.

January 25: Course 214, Skills of Expert Testimony. Fairbanks. Sponsored by the Arctic Trails Chapter 71, International Right of Way Association. Contact Sharon McLeod-Everette at 474-2414.

February 6-8: International Conference on Applications of Advanced Technologies in Transportation Engineering. San Diego, CA. Contact K.C. Sinha at (317) 494-2211.

February 6-8: 5th International Conference on Cold Regions Engineering. St. Paul, MN. Contact ASCE at (212)705-7218.

February 26 - March 3: Traffic Control Methods. Santa Barbara, CA. Sponsored by the Engineering Foundation. Call (212) 705-7835.

April 23-26: Engineering 21st Century Highways. San Francisco, CA. Contact ASCE at (212)705-7218.

May 18-20: Engineering Surveying in 1989 - A Profession on the Move. Denver, CO. Contact ASCE at (212)705-7218

June 5-9: Tri-Regional Safety/Traffic Operations Conference. Seattle, WA. Contact Neil Lacey (907)586-7245.

July 10-14: Fifth World Conference on Transport Research. Yokohama, Japan. Write Professor Yukihide Ikano, Chairman of Scientific Committee, WCTR, c/o Association for Planning and Transportation Studies, 5th Floor, Language Service Building, Kioicho 3-33, Chiysodaky, Tokyo 102, Japan.

July 12-14: Course 201, Communications in Real Estate Acquisition. Sponsored by the Arctic Trails Capter 71, Internation Right of Way Association. Contact Sharon McLeod-Everette at 474-2414.

July 15: Course 213, Conflict Management. Sponsored by the Arctic Trails Chapter 71, International Right of Way Association. Contact Sharon McLeod-Everette at 474-2414.

July 24: How to Comply with Hazardous Work Management Regulations. Anchorage, Alaska. Presented by the Environmental Resource Center, Feyetteville, North Carolina. Contact Maryel Tomter at (919) 822-1172.

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Do Your Homework Before Bidding That Project

Number 11, 1988

For all too many public officials, entering into contracts with architects, engineers and contractors can be a perilous undertaking. Public officials should strive to make certain that everything is in place before a construction project is bid or awarded, and that the city follows through sufficiently to ensure that a project is performed according to the contract. To simplify the process, this checklist is divided into three categories:

1. items to consider before the project;
2. items to consider in bidding and awarding the contract; and
3. items to consider in the following up with the contractor once the project has begun.

BEFORE THE CONTRACT IS LET

(1) SCOPE OF WORK

Has the scope of the work been established? Have the elements of the job been defined? Are the directions to the architect, engineer or contractor clear? Have all departments reviewed the plans and given input into the final set of plans?

(2) VIEWING SIMILAR PROJECTS

Have tours been scheduled of similar projects or have plans been discussed with other municipalities or boroughs that have attempted similar types of projects? Has the Alaska Department of Transportation and Public Facilities or the Municipal League been contacted to discuss the project?

(3) SPECIFICATION PREPARATION

Are the specifications well detailed? Have the plans been reviewed with the local building inspector and attorney? Do you have or will you be sure to have a final set of plans completed and available to you before advertising for bids? Is there a complete bidders list so that if amendments are added you can send them out?

(4) PRE-BID CONFERENCE

Have you considered scheduling a conference to review the plans or inspect the site with prospective bidders? Such a conference may eliminate marginal bidders and allow an opportunity to provide bidders with amendments to the specifications.

(5) INTERNAL COMMUNICATION

Are the key people in your organization informed about the schedule and have they been given ample opportunity for input? For example, the building inspectors need inspection schedules, the city clerk, administrator, or treasurer needs cash flow information, and the attorney needs to ensure that documents are complete and proper certifications are included.

(6) FINANCIAL REVIEW

Have finances been reviewed to provide for contingencies and cash flow considerations during the term of the contract? Have the bonds been sold or is a date set for closing the bond issue?

(7) EXTERNAL COMMUNICATION

Have other governmental entities been informed about the project, and have the proper permits been received? These could include highway permits and review by the Environmental Protection Agency, Army Corps of Engineers, Bureau of Reclamation (for power lines), local power company, telephone company, Alaska Department of Fish and Game, Alaska Department of Environmental Conservation, Alaska Department of Transportation and Public Facilities, or other federal, state or local agencies.

(8) PROPERTY OR EASEMENTS

Does your municipality own the property or control the easements where the project is planned?

(9) BONUS OR DAMAGES

Have you considered paying the contractor a bonus for work completed ahead of schedule, or assessing liquidated damages for work performed beyond the schedule completion date?

(10) DISRUPTIONS

Have residents and local businesses been informed about the project and any disruptions that may occur, such as temporary street closures, low or no water pressure, power outages, blocked sewer lines, increased noise levels, or other anticipated or potential occurrences?

(11) UPGRADING SERVICES

Has the municipality tried to maximize the benefit of the construction project by upgrading associated water and sewer lines, adding hydrants, upgrading utilities, expanding or improving pavement, or meeting other community objectives?

BEFORE THE CONTRACT AWARD IS MADE

(1) REFERENCE REVIEW

Have the credentials of the low bidder been checked? Have the references of the contractor been checked, preferably with other communities or governmental jurisdictions?

(2) BIDDER QUALIFICATION

In checking references, did you ask if the contractor finished work on time, met the projected budget, or was a "change order" artist? Did the

contractor do a quality job? Was there a great deal of excess time spent monitoring the project? Did the jurisdiction need to contact the bonding company regarding the performance of the contractor? Were the contractor's subcontractors paid on time?

(3) BID DISCREPANCIES

Did the municipality give the contractor an opportunity to drop out before awarding the contact? Have you made certain that all elements were bid, including amendments and bond requirements? Are there major discrepancies in the low bid from other bids?

(4) BIDDER INSURANCE LIABILITY

Is the contractor insured? Is the coverage adequate? Did the contractor supply payment and performance bonds and an insurance certificate? Does the insurance amount cover the cost of the work? Is the municipality harmless for faults of the contractor and for city inspectors during the job?

(5) LOW BID REVIEW

Has the municipality considered awarding the contract to a contractor other than the low bidder? Is the low bidder a qualified bidder? Did you consider giving all bidding contractors an option to add items not included in the specification that, if included, may change the overall low bid?

(6) BID AMENDMENTS

Have you checked that all amendments are signed and included before the contract is awarded?

(7) GRANT AGENCY REQUIREMENTS

Has the bidder met the requirements of any agency that is providing a grant? Does the contractor provide for record keeping requirements or meet other items required by a grant agency?

(8) OWNER REPRESENTATION

Who represents the owner? Has the governing body assigned the responsible party to the project? Who will sign and make decisions regarding change orders? Who will coordinate the payment schedule? Who will coordinate the inspection schedule of the architects, engineers, and city staff?

AFTER THE CONTRACT IS AWARDED

(1) PRE-CONSTRUCTION CONFERENCE

Has the municipality made plans to set up weekly meetings with the contractors to ensure that work is on schedule, change orders are properly reviewed, and all parties are informed of progress? The contractor and municipality should establish a mutual time at the onset of the project. Have all documents been submitted to the municipality prior to construction?

(2) PROJECT SUPERINTENDENT

Has the municipality identified the project superintendent and who might replace him if problems arise?

(3) GRANT FOLLOW UP

Has the state or other granting agency been notified regarding required permits, payment schedules, or documentation needed during construction of the project?

(4) SCHEDULE OF PAYMENTS

Have payments been scheduled to meet the cash flow requirements without losing interest on investments or incurring penalties?

(5) JOB SECURITY

Has the contractor made provisions for protecting materials and supplies on the job to avoid theft or damage?

(6) COMMUNICATION

Has the staff provided periodic updates to the city council and news media regarding the status?

(7) PENALTY ASSESSMENTS

Has the contractor been informed that he may be assessed liquidated damages for completing the project late due to increased engineering, legal or staff time?

(8) USE OF ARBITRAGE

Have you calculated any arbitrage or bond payments and earmarked the money? Will work be accomplished within the required time period?

(9) WARRANTY

Has the contractor been informed that he is responsible for the work for a specified time period after final completion as determined by the municipality?

(10) FINAL PAYMENT

Before final payment, have you advertised? If there are claims for subcontractors, have you informed the general contractor? Is the work on a final punch-list completed before final payment is made?

FINAL COMMENTS

It is extremely important to give a great deal of thought to the scope of work, finances, parties involved, and management before the plans begin. It is also important to ensure that there will be adequate inspection and supervision during the project. Public projects should be viewed as long-term commitments by public officials. With the development of a comprehensive strategy, it is more likely that a community will have the full benefit of a successful and well-built public project that will please everyone concerned.

(Adapted from an article by Gary L. Sears, City Manager of Glendale, Colorado, that appeared in the spring/summer issue of the Mass Interchange. *This article was reviewed by Attorney Peter Waltonen, Massachusetts Department of Labor and Industries)*

For More Information

For back issues of our newsletters and notes, or to get on our mailing list, write: Publications, Transportation Technology Transfer Program, University of Alaska-Fairbanks, Fairbanks, AK 99775-1760. For more information, you can also call John D. Martin, P.E., at (907) 451-5150 or Dr. Jan Botha at (907) 474-7497.

Deadly and Contagious Computer Virus

Computer viruses present a significant threat to users of micro-computers, especially those who exchange public domain programs and information with other computers, either by modem or disk transfer.

What is a virus?

Over the years, a few mischievous and malicious hackers have developed various ways of sabotaging other machines, and have released their programs into the public data stream, primarily through electron bulletin boards.

Some of these creatures include the Trojan horse, an apparently normal program, usually a game or utility, that destroys files as its host disk is used, and the time bomb, which waits a certain time period before destroying data. Most recently, we have seen a number of cases of a new type of saboteur program - the virus.

Like its biological cousin, a computer virus embeds itself within a host to replicate itself. Viruses are often not well understood, partly because of their name association with human diseases, and partly because they inhabit the arcane world of machine language programs. Disks do not infect each other in the storage box, but rather, the virus program must take control of the computer in order to infect other disks.

Currently, the most common approach is for the virus program to be hidden within the operating system program (COMMAND.COM on PC machines). Once loaded into memory, the virus program instructs the operating system to copy itself onto any disk accessed by the computer (such as with DIR, TYPE or COPY), if that disk already has the operating system file on it. Then, typically, after replicating itself a certain number of times, the virus proceeds to trash all the disks available to it at the time.

Actually, the virus mechanism is benign by itself. According to an article by Tom McBride and Nick Szabo in the March 1 edition of *Info-Mat*, "a 'pure' virus has survival as its only goal." But any kind of "payload" can be attached to the virus, enabling it to print a message on screen, improve its survivability, avoid detection, or even destroy disk data. The payload can also be benign, but destructive or obstructive payloads seem to be the rule among the viruses reported recently.

Case History

Although the concept of virus programs has appeared in the literature for several years (see "Computer Recreations" in *Scientific American*, March 1985, for an interesting discussion), only in the last year have many actual virus outbreaks been reported. Recent accounts cite infections within several user groups, in computer networks at IBM and Hewlett-Packard, and at the computing centers of several universities.

One of the most widely publicized occurrences was at Lehigh University, where late last fall a COMMAND.COM virus infected PCs throughout the campus. The virus most likely escaped the campus and is now spreading itself around the world. Its characteristic is to copy itself four times, then trash every disk in the host system by erasing their boot records, FAT tables and directories. Meanwhile, the virus' four children will repeat the process somewhere else as soon as they are booted into another PC.

In a memo circulated at Lehigh University, Kenneth R. Van Wyk of the Computing Center stated that "all Norton's horses couldn't put it back together again," referring to the inability to recover data even with the Norton Utilities, one of the most powerful PC data repair programs available. He went on to say that both floppy and hard disks were affected, and concluded by saying, "This is not a joke. A large percentage of our public site disks have been gonged by this virus in the last couple days."

What is the degree of danger?

Obviously, the potential for damage by viruses (and other sabotage programs) is very serious, although there are some who argue that the whole issue may be a hoax or urban legend, the computer-age equivalent of the Kentucky Fried rat story. I doubt that anyone at Lehigh University would buy the hoax theory, but to the millions of users who have not come into contact with a virus, the whole thing certainly has a science-fiction ring to it. In fact, similar scenarios appeared in stories by several authors long before actual virus programs were created.

So far, viruses that use the operating system as a host are fairly easy to detect, and detection is the prime requirement for prevention. Szabo, who has made a hobby of designing (but not releasing) virus programs, feels that greater dangers may lie ahead. To put viruses into binary files other than the operating system is possible, he says, and would make detection much more difficult. The virus discovered last fall at Hebrew University of Jerusalem is reportedly of this type. Because of its ability to propagate itself to other disks, a virus hidden in a program file would be much more destructive than earlier vandal programs, which depend on people for distribution.

A few simple precautions can usually protect against the known types of viruses. We can only hope

that if more virulent types are developed, they will also be detectable and preventable, and that the threat of viruses will not put telecommunication and the public exchange of software in the deep freeze. It seems likely that as the complexity of the virus programs required to foil existing security precautions increases, the interest in creating such programs will wane. Of course, who knows what some maniac will come up with next?

How to protect yourself

Single-user systems are pretty safe from viruses, because of minimal disk sharing. Every disk exchange, new program coming in, and modem or network communication link is a potential avenue of entry for viruses and other vandal programs. An isolated machine with a bootable hard disk, that is never booted from a diskette, should be safe from operating system viruses. But the potential presence of viruses of other vandals in executable program files suggests the need for more care to be taken. New programs from public-domain or unknown sources should be tested in isolation at first; several runs may be necessary to guard against a Trojan horse.

Sound backup procedures and conscientious handling of disks are very important elements in protection against virus programs. Important data and programs should be stored and backed up on disks without the operating system, and write-protected tabs should be used whenever possible. (Covering the square notch in the edge of the diskette shell prevents data from being written onto the disk.) Keep "clean," write-protected copies of operating system and program disks archived.

Detection of suspected viruses is essential. The Lehigh virus is easily detected; the COMMAND.COM file on infected disks carries a more recent write date than the original file, although the file size remains the same.

Another test is to boot up with the suspect disk (it would be wise to first back up the hard disk or use a diskette-only machine, since the program may be ready to do its dirty work), then ask for the directory (DIR d:) of another diskette, with a known "clean" operating system, with its write-protect notch covered. Getting a directory is normally a read-only operation, but if the virus is in control of the system it will try to write itself to the clean disk, generating a write-protect error. It seems reasonable to assume that similar tests will work with other operating systems.

Another reported virus can inhabit any executable (.COM or .EXE) file. Each time the program is executed the virus increases the size of the file (normally by 1808 bytes), which eventually causes the program to overflow disk space, memory space or both. Also, shortly after infection, the virus will slow the host program by as much as a factor of five. This particular virus will erase any infected program that is executed on a Friday the 13th. To test for this virus, compare the program file size before and after running the program, or compare it to the size of the file on the original program disk (write-protected!). If file size has increased, the program, and others on the same disk, are most likely infected.

If a virus is found, copying the system file or executable files from a "clean" disk onto the infected disk will eradicate the virus (first make sure the computer is not infected by booting from a "clean" disk). Disks do occasionally lose data, but any time one of your disks is scrambled for no apparent reason, you should begin a careful check for viruses or other suspect programs. Above all, be aware that these things exist, and be on the lookout for them.

Several anti-virus programs have been developed that may offer attractive benefits to users whose systems are especially vulnerable to attack (network installations or semi-public sites), or who are in the vicinity of known virus infection.

If you are concerned and want to know more about viruses, read the *Info-Mat* news magazine, available on-line through the PC-TRANS-port electronic bulletin board. *Info-Mat* has done a terrific job of covering the virus story as it developed over the past few months, and because it is a BBS magazine, they will no doubt continue to provide in-depth information on the subject.

This article was originally published asranscribed from "Watch Out for Viruses" by Carl Thor, in PC-Transmission, *Vol. 2, No. 7, April 1988.*

For More Information

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NEW PUBLICATIONS AVAILABLE FOR LOAN

Number 13, 1988

Place a check by the publication(s) you wish to receive.
AST=365

____ **America on the Move - The Story of the Federal-Aid Highway Program**, ID-358, FHWA, 33 pp.

____ **Airport Design Standards - Airports Served by Air Carriers - Taxiways**, ID-353, FAA, May 1970, 45 pp.

____ **Bridge Management Systems, Feasibility of Incremental Benefit-Cost Analysis for Optimal Allocation of Limited Budgets to Maintenance, Rehabilitatio, and Replacement of Bridges**, ID-346, FHWA-DP-71-2, February 1988, 203 pp.

____ **Bridge Needs, Design and Performance**, ID-337, TRB REC 1118, 1987, 98 pp.

____ **Catalog of Research Studies and Reports**, ID-327, Texas Cooperative Highway Research Program, January 1988, 228 pp.

____ **Chemical Composition of Asphalt as Related to Durability**, ID-360, FHWA-RD-84-047, 1984, 46 pp.

____ **Compilation of State Laws and Regulations on Matters Affecting Rail-Highway Crossings**, ID-333, FHWA-TS-83-203, April 1983, 425 pp.

____ **Design and Operation of Work Zone Traffic Control - Participant's Notebook**, ID-329, US DOT, 1987, 270 pp.

____ **Designing Safer Roads**, ID-341, TRB Special Report 214, 1987, 319 pp.

____ **Determination of the Operational Performance Requirements for a Roadside Accident Countermeasure Warrant System Vol. I-Executive Summary**, ID-340, FHWA-RD-85-113, May 1985, 22 pp.

____ **Frost Susceptibility of Soil - Review of Index Tests**, ID-347, CRREL Monograph 81-2, December 1981, 121 pp.

____ **Frost Susceptibility Ratings and Pavement Structure Performance - Draft Report**, ID-348, AK-RD-81-9, 1981, 42 pp.

____ **Fundamentals of Traffic Engineering, 10th Edition**, ID-339, University of California Institute of Transportation Studies, 1981, 311 pp.

____ **Guide Procedures for Concrete Pavement 4R Operations**, ID-335, AASHTO-AGC-ARTBA, 1985, 114 pp.

____ **A Guide to Ramp Intersection Analysis**, ID-355, Caltrans, July 1974, 43 pp.

____ **Highway Snow and Ice Control, State-of-the-Art**, ID-350, Swedish Road and Traffic Research Institute, September 1985, 124 pp.

____ **Improved Fabrication and Inspection of Welded Connections in Bridge Structures**, ID-361, FHWA-RD-83-006, October 1984, 304 pp.

____ **Life Cycle Costing of PAved Alaskan Highways, Vol. I and II**, ID-356, AK-RD-83-5,6, June 1982, 173 pp.

____ **A Literature Search for Substitute Materials in Frost Protecting Layers**, ID-349, FHWA-AK-RD-82-7, May 1981, 3 pp.

____ **Longitudinal Edge Drains in Rigid Pavement Systems**, ID-352, FHWA-TS-86-208, July 1986, 135 pp.

____ **Maintenance Activities Accomplished by Contract**, ID-344, TRB SYN 125, July 1986, 42 pp.

____ **Maintenance and Highway Safety Handbook**, ID-362, FHWA-TS-77-223, 1977, 66 pp.

____ **Mastering Traffic Engineering**, ID-357, Military Traffic Management Command, August 1981, 69 pp.

____ **Mathematical Model to Correlate Frost Heave of Pavements with Laboratory Predictions**, ID-354, CRREL Report 80-10, February 1980, 54 pp.

____ **Pavement and Shoulder Maintenance Performance Guides**, ID-359, FHWA-TS-84-208, August 1984, 42 pp.

____ **Pavement Subsurface Drainage Systems**, ID-342, TRB SYN 96, November 1982, 38 pp.

____ **Practical Guidelines for Minimizing Tort Liability**, ID-343, TRB SYN 106, December 1983, 40 pp.

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____ **Rural Transportation Accounting**, ID-326, DOT-I-87-8, October 1987, 171 pp.

____ **Safer Timber Utility Poles, Vol. I - Summary Report**, ID-330, FHWA-RD-86-154, September 1986, 169 pp.

____ **Safety in Construction Zones Where Pavement Edges and Dropoffs Exist**, ID-345, Texas Transportation Institute, January 1988, 50 pp.

____ **The Seventh National Conference on Rural Public Transportation - Final Report**, ID-325, DOT-I-86-19, February 1987, 159 pp.

____ **Soil Stabilization in Pavement Structures Vol. I - Pavement Design and Construction Considerations**, ID-332, FHWA-IP-80-2, October 1979, 202 pp.

____ **Standard Specifications for Movable Highway Bridges**, ID-336, AASHTO, 1988, 75 pp.

____ **Structural Design Manual for Improved Inlets and Culverts**, ID-363, FHWA-IP-83-6, June 1983, 338 pp.

____ **Traffic Engineering Services for Small Political Jurisdictions**, ID-334, FHWA-RD-IP-77-6, January 1977, 142 pp.

____ **A Training Manual for Setting Street Maintenance Priorities**, ID-328, DOT-I-79-21, August 1979, 31pp.

____ **Transportation Glossary**, ID-351, AASHTO, 1983, 127 pp.

____ **UMTA Technical Assistance - A User's Guide**, ID-338, UMTA, 1984, 26 pp.

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____Blading Unpaved Roads, ID-8, FHWA/NACE, 4/88, 22min. For the motorgrader operator, this tape demonstrates the basics of maintaining unpaved roads, complementing the NACE book on blading.

____Cleaning and Clearing of Bridges, ID-9, FHWA/IRF 14 min. Covers the proper cleaning and clearing of bridges, including equipment needed and procedures to follow.

____**Equipment Maintenance - Programming and Scheduling**, ID-16, Montana State University, 55 min. A practical approach to assuring reasonable maintenance of fleet equipment used in the construction and maintenance of city streets.

____**The Flagger**, ID-20, Washington State Dot, 43 min. This is a simple instructional tape on flagging that covers qualities of an ideal flagger, attire, equipment, station, using the stop/slow sign and hand signals, advance warning signs, and some actual situations.

____**Guardrail Maintenance**, ID-22, Utah DOT, 15 min. This tape covers procedures for repairing typical sections, turned down end sections, and bridge connections for the maintenance worker.

____**Highway Sanders**, ID-25, Utah Dot, 12 min. This tape describes the operation and maintenance of hydraulic sanders mounted in dump truck beds. It includes hookup, daily checks, basic operation, clean up, and storage.

____**The Importance of Roadway Drainage**, ID-27, Transportation Information Exchange, 50 min. A lecture-style training tape emphasizes the importance of good roadway drainage, and stresses the need for a proper inventory of culverts, drainage areas, and problem areas.

____**Keyed RipRap**, ID-29, FHWA, 12 min.

____**Maintenance Management and Equipment Management**, ID-35, M2, 2 parts, 60 min.

____**Operator Daily Maintenance of Dump Trucks**, ID-42, FHWA/IRF, 1985, 20 min. General methods and procedures for operator daily maintenance of dump trucks, including pre-start, warm up, operator, and shut down checks.

____**Operator Daily Maintenance of Front and End Loaders**, ID-43, FHWA, 18:48 min.

____**Operator Daily Maintenance of Motorgraders**, ID-44, FHWA/IRF, 21 min. Describes general daily maintenance procedures for motorgrader operators.

____**Patching Unpaved Roads**, ID-46, FHWA, 11:25 min.

____**Patching with Hand Tools**, ID-47, Utah DOT, 12 min. This video illustrates the correct procedures for patching asphalt pavements with hand tools.

____**Pavement Maintenance (Part 4) - Patching and Crack Filling**, ID-51, Montana State University/The Asphalt Institute, 55 min. Lecture tape discusses various types of patching and the repair of cracks, potholes, and other pavement surface distresses. Concentrates mainly on asphalt concrete pavements.

____**Pavement Maintenance (Part 5) - Rigid Pavement Maintenance**, ID-52, Montana State University/The Asphalt Institute, 25 min. A lecture tape discussing the use of asphalt in maintaining, repairing, and overlaying PCC pavements.

____**Prestressed Concrete Bridge And Safety Inspection**, ID-60, Penn DOT, 60 min. This tape discusses the inspection of prestressed concrete bridges. It includes procedures, sequence, the planning of an inspection, equipment, what to look for, and background information on prestressed concrete.

____**Reshaping Earth and Gravel Shoulders**, ID-62, FHWA/IRF, 15:26

____**Sealing Cracks**, ID-83, Utah DOT, 8 min.

____**Snow and Ice Control, Parts I and II**, ID-80, Utah DOT, 67 min. Part I discusses snowplow equipment, supplies, routing, and types of service as used by the Utah DOT. Part II discusses types of snow, temperature, plowing procedures, and clean up.

____**Snowplows**, ID-68, 2 Parts, Utah DOT, 20 min. Part 1 explains the mounting, daily checking and storing of straight-blade snowplows mounted on trucks. Part 2 covers the operation of these types of plows, including safe speeds, direction of travel, positioning, plowing near obstructions, and the hazards of water ponding.

____**Stabilization: Holding the Road**, ID-69, Iowa State University, 22 min. This tape looks at an alternative to paving unpaved roads for dust control. It shows the steps to take in analyzing the old surface and discusses the various binders or additives which are available.

____**Strategic Planning for State and Local Transportation Agencies**, ID-70, TRB 45 min. This tape explains the concept of strategic planning, its application and practices.

____**Tort Liability**, ID-73, Wisconsin DOT, 47 min. Presentation of current trends in liability and how to protect employees. Participants develop an awareness of the types of exposure and prevention.

____**Tort Liability: A New Perspective, Caution: Litigation Ahead**, ID-74, FHWA, 25 min.

____**Tort Liability of State Highway and Transportation Officials**, ID-75, AASHTO, 53 min. A presentation on current trends towards increased tort liability for highway officials that includes background information on negligence legislation, suggestions on how to protect against undue litigation, and a look at some actual court cases.

____**Traffic Control-Short Term Work Zones**, ID-76, Minnesota State DOT, 90 min. (5 parts) Tape explains the importance of traffic control around work zones. Demonstrates the different methods of traffic control for different situations.

____**Traffic Signal Systems: Go for the Green**, ID-77, FHWA, 33 min.

____**White Gold**, ID-81, APWA and the University of New Hampshire, 25 min. This documentary discusses the numerous types of snow removal equipment and procedures that are used in the northeast region of the nation. Advantages and disadvantages of each type of equipment are discussed.

____**Winter Operations**, ID-82, Penn. DOT, 12 min. A discussion of general winter operations.

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