M A S S

INTERCHANGE

VOLUME 5 NUMBER 4 SUMMER 1991

CAN'T STAND THE HEAT?

Know the Dangers of Heat Stress

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Have you ever experienced dizziness or nausea while in an abnormally warm environment or while out in the sun on a hot, humid day? Maybe you have developed a headache, experienced breathlessness, or noticed a rash accompanied by a prickly sensation. If so, you may have experienced a mild form of heat stress.

Whether you're a construction worker, an inspector, or a member of a survey crew, it can happen to you. However, if you are aware of the causes, symptoms, and preventive measures of this potentially fatal condition, you will be able to fight back...before it's too late.

Heat is a physical stress on the human body. Heat stress is a serious potential health hazard. Make no mistake about it. Heat stress can kill and it can kill quickly.
National Safety Council

Heat Sources...Inside and Out

Being aware of the reasons why your body "can't stand the heat" in unusually warm surroundings will help you understand the causes and imminent dangers of heat stress.

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BREAKAWAY UTILITY POLES

This article was reprinted from FHWA Report #FHWA SA-91-003 with Massachusetts information being annotated by Baystate Roads Staff. The Massachusetts information and photos were generously supplied by Mr. Robert Gardner, Research Coordinator MDPW, and Mr. William Quirk, Engineer for New England Power Service. Mr. Richard Smith is the New England Telephone Project Coordinator.

Executive Summary

This report describes the installation of ten breakaway timber utility poles in Lexington, Kentucky. Installations were made by Kentucky Utilities Company personnel and monitoring has been performed by Kentucky Transportation Center investigators.

Modified poles have not been struck by vehicles to date. Monitoring will continue until September 1991 at which time a final report will be issued.

Also, annotated by print in script, are changes and aspects from experience in Massachusetts. Eighteen breakaway poles have been installed to date with plans for one additional installation. In Massachusetts, this is a cooperative effort of the Federal Highway Administration, the Massachusetts Department of Public Works, Massachusetts Electric and New England Telephone. There have been four impacts of vehicles with breakaway poles in Massachusetts with very favorable results.

This photograph shows an excellent view of the hinge component and also displays the bent straps which were replaced.

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FREE ROADSHOWS - WHILE THEY LAST

The Baystate Roads Program has held several Roadshows in the past few months. The objective of these visits is to conduct training out in the local public works departments. These sessions are geared at training for operator level employees who are unable to attend a Baystate Roads Workshop. The picture shows part of the Milton public works force watching a video portion of a Roadshow on the Commercial Driver's License. The deadline of 1 April 1992 is very rapidly approaching. As the deadline draws closer and closer there will be a reduced availability of training due to weather restrictions and competition from other municipalities. If you would like a Roadshow on the Commercial Driver's License please call quickly. Contact Silvio Baruzzi at (413) 545-2604.

Other Roadshow topics include safety, how to grade a gravel road, proper method of pothole patching, or just about anything else you may want. There is no charge for a Roadshow training session. The host town merely arranges for a room with a TV and a VCR.

SPECIAL NOTICE
LIMITED TIME ONLY
FIRST CALL FIRST SERVED

IN THIS ISSUE

A QUICK REFERENCE GUIDE TO RECOGNITION AND TREATMENT OF HEAT STRESS EMERGENCIES

	SYMPTOMS	CARE
HEAT CRAMPS	- Muscle Twitching - Painful Spasms in Legs, Arms or Abdomen	- Apply firm pressure or gently massage affected muscles. - Slowly administer sips of salt water (1 tsp. of salt/qt. of cool water) over a period of 1 hour.
HEAT SYNCOPE	- Fainting or Lightheadedness	- Lie down in a cool environment.
HEAT EXHAUSTION	- Dizziness - Headache - Breathlessness - Thirst - Clammy Skin - Profuse Perspiration - Elevated Body Temperature - Tingling Sensations in Hands or Feet	- Move the victim to a cooler environment and lie on back with legs elevated 8-12". - Loosen clothing - Slowly administer sips of salt water (1 tsp. of salt/qt. of cool water) over a period of 1 hour. - Apply cool, moist cloths to body or fan the victim.
HEAT STROKE	- Dry Hot Skin - NO SWEAT - Rapid Pulse - Bluish or Red Skin Color - High Body Temperature (105°+F) - Mental Confusion - Unconsciousness	**IMMEDIATELY CALL AN AMBULANCE** Do **NOT** offer the victim any stimulants such as tea, coffee or alcoholic beverages. Give the victim water ***if coherent and able to swallow*** - Move the victim to a cooler environment - Remove outer clothing - Then ***either*** Continually sponge the victim's skin with cool water; ***OR*** Repeatedly administer cold packs; ***OR*** Immerse the victim in a tub of cold (***not*** ice) water; ***OR*** if no water is available fan the victim to promote cooling. - Continuously monitor body temperature. Repeat process as necessary until medical personnel arrive.

CAN'T STAND THE HEAT?

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Heat stress can be caused not only by the temperature of the external environment, but also by internal body temperature. Bodily functions are the source of metabolic or body heat. As a person performs more tasks, metabolic heat rises. Externally imposed heat, on the other hand, is derived from the temperature of the surrounding environment. Unfortunately, externally imposed heat can increase the level of metabolic heat. In addition, factors such as humidity, air temperature, and air velocity all affect the interaction between body heat and the external environment.

Regardless of the heat source, certain body mechanisms normally respond automatically to an increase in body temperature. The first heat control mechanism is an increase in blood circulation. Under conditions of extreme heat, the blood circulates closer to the skin's surface so heat is expelled to the surrounding air.

As the temperature of the surrounding air increases above normal body temperature, the only other heat control mechanism available is evaporation, the vaporization of sweat on the surface of the skin which, in turn, cools the body. Evaporation acts as the final source to regulate the body's temperature. However, in conditions of high humidity, even this mechanism stops working and the first signs of heat stress appear.

Heat Signals

Some people, such as the elderly, small children, overweight individuals, and alcohol or drug abusers, are more prone to heat stress than others. No matter who you are or what your physical condition may be, the telltale signs of heat stress are the same.

As in any other physical condition, there are graduated levels of heat stress ranging from mild (heat rash) to semi-serious (heat cramps, heat syncope, and heat exhaustion), to serious (heat stroke).

Heat rash is characterized by the appearance of a rash, sometimes referred to as "prickly heat." This sympton of heat stress is a result of the sweat ducts becoming clogged which causes inflammation of the sweat glands, producing a rash.

Heat cramps consist of muscle twitching or painful spasms in the arms, legs, or abdomen as a result of an inability to replenish salt excreted with sweat.

Heat syncope is apparent when the victim faints or experiences light-headedness. Generally, heat syncope appears in individuals who are standing still in a hot environment. This results in "pooling" of the blood in the enlarged blood vessels in the skin and trunk of the body. Fainting occurs because of the reduced blood flow to the brain.

Heat exhaustion carries many signals of bodily distress including dizziness, weakness, headache, breathlessness, thirst, slow pulse, pale or clammy skin, profuse perspiration, elevated body temperature, or tingling sensations in the hands or feet. These symptoms are caused by a reduction in body fluids and salt due to sweating.

Heat stroke is the most dangerous form of heat stress and can result in brain damage and/or death. The signs of heat stroke include dry, hot skin (no sweating), bluish or red skin color, unusually high body temperature (105° F or higher), rapid pulse, mental confusion, or loss of consciousness. Heat stroke is a result of prolonged exposure to extremely high temperatures causing the body's temperature regulation mechanisms to shut down.

Regardless of whether a victim is experiencing a mild form of heat stress or a life-threatening form, immediate action must be taken to restore the body's temperature to a normal level.

Every Second Counts

Responding to the heat stress victim in an appropriate and timely manner is the key to ensuring recovery. Follow the specific procedures listed below to alleviate the symptoms of each form of heat stress.

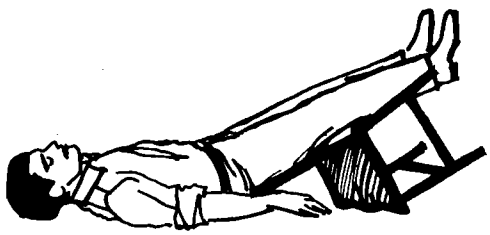
Heat Cramps. 1) Apply firm pressure or gently massage affected muscles. 2) Slowly administer sips of salt water (1 teaspoonful of salt per quart of cool water) to the victim over a period of an hour.

Heat Syncope. Fainting can be prevented or stopped by having the victim lie down in a cool environment.

Heat Exhaustion. 1) Move the victim to a cooler environment. Have the person lie flat with legs elevated 8 to 12 in. 2) Loosen clothing. 3) Slowly administer sips of salt water (1 teaspoonful of salt per quart of cool water) to the victim over a period of an hour. If vomiting occurs, discontinue giving the victim water and contact medical personnel. 4) Apply cool, moist cloths to the victim's body and/or fan the victim. 5) If the victim is also suffering from heat cramps, massage affected muscles until tension is reduced. 6) If at any time the victim's symptoms continue or worsen, seek medical attention immediately. 7) After experiencing heat exhaustion, the victim should be advised not to return to work for approximately one week. In addition, he or she should avoid exposure to unusually warm environments.

Prompt first aid can prevent permanent injury to the brain and other vital organs. Studies have shown that the higher the victim's body temperature when he or she is admitted to the emergency room, the higher the mortality rate.

National Safety Council



Heat Stroke. Heat stroke and heat exhaustion require different responses. Because of the severity of heat stroke, it is crucial that an ambulance be called immediately. While waiting for medical help to arrive, follow these steps to cool the victim's body as rapidly as possible. *Remember: Heat stroke is a life or death circumstance so speed and care are of utmost importance.* Do **not** offer the victim any stimulants such as tea, coffee, or alcoholic beverages. You may give the victim water if he or she is coherent and able to swallow.

1) Move the victim to a cooler environment.
2) Remove the victim's outer clothing.
3) Then either:
   - Continuously sponge the victim's skin with cool water or rubbing alcohol, or
   - Repeatedly administer cold packs, or
   - Immerse the victim in a tub of cold (not ice) water or pour any cool liquid on the body, or
   - If no water is available, fan the body to promote cooling.
4) Continuously monitor the victim's body temperature. When the temperature has dropped below 102°F, dry him/her off. If an increase in temperature occurs prior to the arrival of emergency personnel, repeat cooling process.

An Ounce of Prevention

You need to be able to respond to a heat stress victim to ensure recovery. But even more importantly, you should know what actions can be taken to prevent the condition.

The prevention of heat stress in warm environments involves: 1) The implementation of control measures by management to reduce worker risk, as well as 2) The implementation of safe work practices by employees in monitoring their own body temperature. Control measures implemented by supervisors play a key role in worker safety.

Upon hiring a new employee to work in an abnormally warm environment, allow the worker ample opportunity to adapt to the temperature level. Fortunately, humans have the ability to adjust to severe heat through the process of acclimatization. Automatic adjustments in body temperature and

pulse rate are made to compensate for the unusually hot conditions. This process occurs gradually over a brief period of time as the worker becomes "acclimated" to the new surroundings.

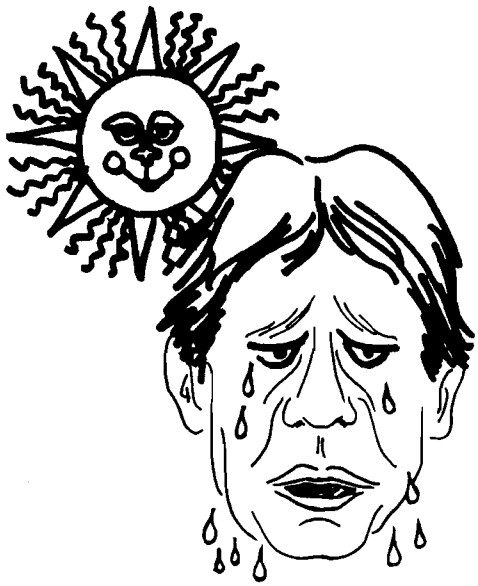
To assist the new employee in this process, schedule the individual to work half the average workload on the first day. Additional time should be added in increments of 10 percent each subsequent day over a five-day period.

It is important to remember that acclimatization applies to a specific level of heat that the worker is accustomed to - signs of heat stress may appear at any level above that temperature. In addition, the acclimatization process may diminish during weekends, over vacation periods, or after illness. Therefore, the process may need to be repeated under some circumstances.

Once the worker has completed the acclimatization process, help the person maintain a safe condition to further prevent heat stress by adhering to the following guidelines.

- Arrange the schedule so that workers either start earlier in the day when it is cool and/or require performance of more physical tasks early in the day. (Provide for additional personnel in performing extremely physical tasks in high temperatures.)
- Do not push workers to work longer hours or additional days.
- Scheduled breaks, preferably in a cool environment, should be enforced on a regular basis.
- Ensure that workers are drinking enough water to replenish water lost due to sweating. This may mean drinking 10 to 12 ounces of water every 20 minutes, depending on the individual and current conditions.
- Use more efficient mechanical systems such as cranes, lifting devices, and tools, where possible. Improved or upgraded systems will serve to reduce the physical work required of the body and keep metabolic heat at a safe level.
- Provide employees with information on the symptoms and dangers of heat stress as well as emergency procedures so they can monitor their own bodies to determine if they need a rest break or a water break and provide assistance to others in distress.

If you are in a supervisory role, you can provide the framework for a successful heat stress control program by following the above guidelines.



To take the preventive process a step further, you may also need to provide personal protective clothing for workers. The type of clothing used depends on the specific conditions of the environment.

In humid environments, the worker should wear lightweight cotton fabrics or loosely fit clothing. Both allow for sweat evaporation. Clothing with a tight fit as well as synthetic fabrics should be avoided.

In environments where the temperature of the air is cooler than the temperature of the skin, less clothing should be worn since it will interfere with the body's ability to expel heat into the surrounding air. On the other hand, if the air temperature of the environment is more than the skin temperature or if radiant heat is involved, protective clothing such as aluminum reflective clothing or insulated gloves is essential.

Under circumstances of intense heat, a thermal vest may be supplied to help regulate worker's body temperature. These vests usually contain inner cloth pockets that may hold up to six cold packs. Some vests may comfortably be worn underneath clothes.

Whatever precautions are taken in the prevention of heat stress, they will serve to ensure a safer environment for workers. In addition, the comfortable work environment will maintain workers' concentration and agility at a normal level. The bottom line is fewer accidents in the workplace.

Whether at work or at play, the causes, symptoms, care, and prevention practices for heat stress remain the same. Be sure you know the signs - it could save your life or the lives of others.

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Shelton, Ronald, *Heat Illness and Athletics,* Rockford Clinic, 2300 N. Rockton Ave., Rockford, IL 61103

The author, Paula Ryan, writes feature articles and is employed by Lab Safety Supply, Inc., Janesville, WI. Lab Safety Supply is a business-to-business direct marketer of environmental and personal safety products including personal protective clothing and heat stress products.

VOLUNTEER NEEDED

The Baystate Roads Program has purchased a new computer program, and is looking for a volunteer to help demonstrate it. Believe it or not, we do not want a computer wizard to help us install the program. The person we are looking for is someone who has limited reading ability but currently has a Class II license. The R.O.A.D. (Real Opportunity for Advancement and Developement) to Success is a course of interactive computer software designed to help drivers develop reading skills needed to study for and pass the federally legislated CDL exam. Instruction manuals are written at the fourth to seventh grade readability level. This program was developed by a unique service delivery partnership of industry/labor/education including the Pennsylvania Department of Education, American Federation of State, County, and Municipal Employees, and Penn State University's Institute for the Study of Adult Literacy. The program has been funded by the U.S. Department of Education under the National Workplace Literacy initiative.

The volunteer must have access to:

Software: IBM DOS 2.0 or greater

Hardware:

- Computer
  IBM - PC, PC-XT, PC-AT, PS/2 models 25, 30, 50, 60, 70 or 80,
  Tandy, or
  100% IBM compatible computer;
- Graphic Adaptor
  CGA, EGA, VGA, or MCGA;
- Monitor (Monochrome or Color,
  Color recommended);
- Hard Disk Drive; 17 Megabytes
  required for total software package
- Mouse
- one Floppy Drive
  360K, 720K, or 1.44 MB;
- 640K RAM;
- Printer (optional but recommended)

Anyone interested in volunteering should contact Silvio J. Baruzzi at the Baystate Roads Program, (413) 545-2604.

McTRANS ANNOUNCES McPRIMER

McPrimer is a 150 page primer accompanied by a self-paced, self-scoring tutorial disk covering introductory PC topics. It gives a complete overview of the Disk Operating System (DOS) and a introduction to a few applications to first-time computer users. The tutorial disk allows users to move at their own pace and provides hints and quiz scoring feedback to assure success.

Topics covered include:

- PC hardware systems and how they work
- Key DOS commands and file management tasks
- Advanced DOS activities of batch file creation
- Hard drive management, organization and back-ups
- Introduction to Lotus 1-2-3
- Word processing and database concepts

A typical benefactor of this learning system is the person new to PCs, or one with some experience but desiring refinement in the areas mentioned above. Many first time users have a fear concerning accidental data loss or just plain embarrassment from "ordinary" questions. McPrimer eases the user through these concerns quickly and in a relaxed, enjoyable manner at their own pace.

McPrimer can be purchased from the McTrans Center for $20, which includes the tutorial disk and a companion instruction book. For additional information or to order McPrimer contact:

McTrans Center
University of Florida
512 Weil Hall
Gainesville, FL 32611-2083
Phone: (904) 392-0378
Fax: (904) 392-3224

BREAKAWAY UTILITY POLES

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Introduction

There are approximately 3.9 million miles of public roads and streets within the United States. It has been estimated there are as many as 88 million utility poles located within the rights-of-way of those roads and streets. Vehicles colliding with fixed objects adjacent to the roadways account for 4.3 percent of all accidents and 9.3 percent of all accidents involving a fatality. Vehicles colliding with fixed objects adjacent to roadways are 2.2 times more likely to lead to a fatality than other first harmful events. Approximately 1,500 persons are fatally injured each year as a result of vehicles impacting utility poles. Vehicle-utility pole accidents account for approximately 65,000 other types of injuries yearly. Approximately 85 percent of pole accidents occur within urban areas. Utility poles are second only to trees as the most frequently struck obstacles in fatal accidents.

Countermeasures to minimize vehicle-utility pole collision problems include: a) place utility lines underground, b) place poles further from the roadway, c) reduce pole density, d) shield poles, and e) use breakaway poles. All of the options would be relatively expensive for use in correcting existing hazardous situations. The options should be considered for new or relocated installations.

Breakaway timber utility poles were first considered for use in the late 1960's. FHWA officials forwarded a prospectus to personnel in each state in October 1983 and requested responses relative to expressions of interest in participating in field trial installations.

Breakaway Design and Hardware

The breakaway concept reported herein was developed for and tested on 40-ft, class 4 timber utility poles. The modifications for new or in-place poles consist of a slip base lower connection, hinged upper connection, and two overhead guys or upper support cables. The slip base is designed to withstand moments imposed by wind loads.

The lower shear plane is created by sawing through the pole perpendicular to the long axis at an elevation that is or will be 3 in. above the ground line. The shear plane consists of two 5/8 in. or two 3/4-in. thick base plates separated by a 0.0179-in. keeper plate and serves to maintain a fixed diameter circle for six 1 1/8-in. diameter bolts which are used to connect the 5/8-in. or 3/4-in. plates.

Each base plate is welded to 30-in. long steel pipe or mechanical tubing and is braced by six stiffeners welded to the base plate and pipe or tubing. A 1/4-in. thick washer is used under each bolt head and under each nut. Bolts are 3 1/2-in. in length and are torqued to 200 ft-lb. Pipe or tubing diameter and wall thickness for use is governed by the pole diameter near the ground line.

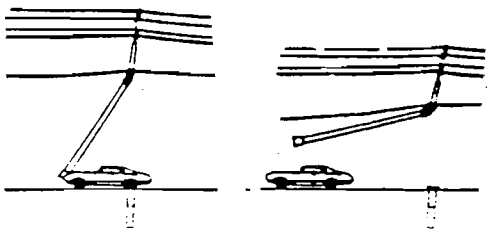
A moment-sensitive upper connection is created by sawing through the pole perpendicular to the long axis at an elevation that is or will be approximately 20 ft above the ground line. The connection consists of two four-part pole bands for installation above and below the cut and four steel straps.

One pole-band assembly is placed above the upper cut and one assembly is placed below the upper cut. The assemblies are to be positioned equal distances above and below the cut so that the center to center distance between assemblies is 16 in. A minimum torque of 100 ft-lb is to be applied to each bolt. A hole is drilled through the pole 8 in. above the cut to accommodate a 1-in. diameter, all-thread bolt to affix the upper pole-band assembly and two opposite straps to the pole. The upper pole-band assembly and other two opposite straps are then affixed to the pole by use of a second 1-in. diameter, all-thread bolt placed 90 degrees and below the first bolt. The pole-band assembly and portions of straps below the cut are affixed to the pole in the same manner used for the upper assembly.

Steel support cables are placed immediately above the upper connection and near the cross arm. The cables are attached to adjacent poles on each side of the breakaway pole. The lower cable serves as a pivot point for the lower pole segment when the pole is impacted by a vehicle. The upper cable is intended to stabilize the upper pole segment and to minimize damage to the power lines. *In Massachusetts, this portion has been modified. Instead of installing two additional cables, a power line (1/2" diameter woven steel cable) and the existing telephone cables are used. To anchor the electrical cable properly, it is deadended on both sides of the crossarm and then a jumper is installed.*

The breakaway timber utility pole is designed to activate when struck by a vehicle travelling at speeds ranging from 20 to 60 mph. It is expected that most of the hardware used for the retrofit would be reusable after an accident. The keeper plate would not be a reusable item. It is possible that all four straps would need to be replaced after an accident.

Breakaway Sequence



Slip base activates

Pole rotates to clear vehicle as hinge bends

Upon impact, slip base bolts shear the keeper plate and the pole slips along the lower cut plane. The pole rotates and one or more strap holes shear to allow for bolt and strap slot relative movement within the area of the pole band assembly below the upper cut.

It is intended that the pole will rotate sufficiently so that the pole clears the vehicle's hood, windshield, and roof and allows the vehicle to pass under the pole without injury to vehicle occupants. It is expected that the pole would be partially supported by the steel cables and conducting lines should remain in service. This concept is illustrated by the Breakaway Sequence on page 7.

This photograph shows the utility pole after impact. (Note how vertical it is at this point.) A close examination of the photo will show the bent hinge straps that had to be replaced. Notice the wide open recovery area in this location with no other hazards.

The current design does not provide for retrofits on poles having tap lines that would create side tension. Poles should not be located in a sharp curve and the breakaway pole should not contain transformers, reclosers, or other units that could cause eccentric loading on the pole. There should be a clear zone to allow the pole to swing free of fixed objects. *An additional requirement, in Massachusetts, was a clear recovery area for the car to travel in after hitting the pole. Some poles have been placed on curves and guided back to prevent them from falling into the roadway upon activation.*

Kentucky Installations

The breakaway timber utility pole hardware may be used to retrofit existing conventional poles, or it may be used on a new pole which could be used for a new installation, or it could be used to replace an existing pole. KU (Kentucky Utilities Company) officials choose to retrofit existing poles for all installations.

Sufficient hardware to retrofit ten poles was ordered. Retrofit hardware cost $1,263 per pole in January 1988, labor and equipment costs were approximately $1,447 per pole, for a total per pole cost of about $2,710.

Traffic control elements, in accordance with the Manual on Uniform Traffic Control Devices, were placed and electrical lines were covered with insulating pads. Two support cables were affixed to the pole to be retrofitted and were then attached to each adjacent pole. The pole ground wire at the base was removed. A collar to support the upper portion of the pole was placed around the pole within six to eight feet of the top of the pole and the collar was attached near the end of the boom of the digger derrick. Soil was removed at the pole base. The pole was sawed horizontally 3 in. above ground line and two grooves were sawed in the stub near the ground pole surface to provide channels for distribution of Poleset, a two component thermo setting material. Wood preservative was applied to the upper cut surface. The lower base-plate assembly was placed on the in-ground pole section. Poleset or a similar compound was poured through a hole in the center of the base plate to fill all voids between the pole and base-plate assembly.

The upper base-plate assembly was placed at the base of the out-of-ground pole section. The assembly was positioned above the in-ground section and the keeper plate and six washers were positioned between the base plates. The set screws were loosened and the upper base-plate assembly was rotated to align bolt slots and then the set screws were tightened to provide equal space between the pole and pipe or tube circumferentially. Poleset or its equivalent was placed to fill the void between the upper base-plate assembly and pole. The six sets of bolts, washers, and nuts connecting the lower and upper base plate assemblies were placed and bolts were torqued to 200 ft-lb.

Holes to attach pole bands and straps were drilled through the pole. The pole was cut horizontally approximately 20 ft above the ground line. The pole section above that cut was raised and wood preservative was applied to the cut surfaces. The pre-assembled pole bands were placed above and below the cut. The upper band was positioned and bolts were partially tightened. The lower band was positioned and bolts were partially tightened. The all-thread bolt was inserted and a washer and nut were placed at each end to affix the upper band and two opposing straps to the pole. The other all-thread bolt and remaining two straps were placed on the pole. *Based on utility company standards and experience, the upper bolt connections were changed to through bolts inside of armoring. This was done in part to accommodate wind load and snow and ice. Several utility poles were snapped by high winds in an area near a breakaway pole without effecting the breakaway.*

Bolt holes in opposing straps were used to position the lower band and to affix the lower band and straps to the pole. Bolts were torqued to 100 ft-lb to complete the installation. The pole grounding wire at the base was replaced. An installation could be completed within six to eight hours.

Massachusetts decided to prefab the breakaway poles instead of retrofitting. This gives better overall control of all elements of the process and also allows for full inspection at the base of the pole (since it is out of the ground). It is also

much easier to ensure good fill of the base cap with the self hardening epoxy with the prefab method.

Summary

Ten poles had been retrofitted by October 20, 1989. Company officials will soon decide whether other installations will be placed.

Retrofitted poles have been inspected quarterly and no indications of problems have been observed. No severe weather conditions have occurred since the first installation and none of the retrofitted poles have been hit by a vehicle.

During the week of October 23-27, 1989, KU personnel made a detailed inspection of retrofitted installations. Slight adjustments in some pole alignments were made and bolt torque was checked at all locations. All bolts were of the specified torque.

Quarterly inspections will be continued until September 1991 at which time a final report will be issued. *In Massachusetts quarterly inspections are conducted which include torque checks of all bolts.*

As mentioned in the Executive Summary, there have been four incidents with Massachusetts breakaway poles.

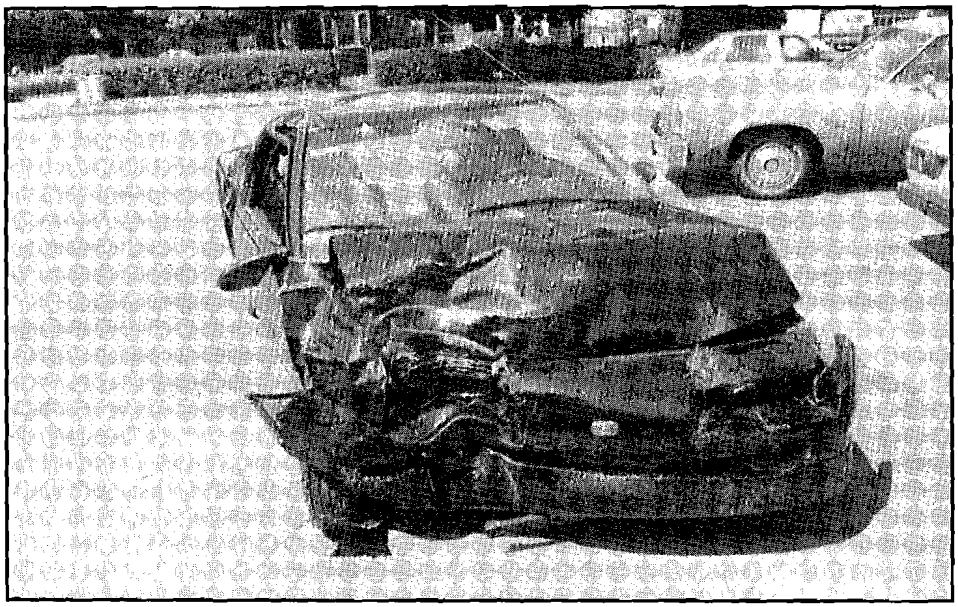
In the first incident a GEO Storm estimated to be traveling in excess of 70 miles per hour hit a breakaway pole 2-3 feet off the ground. The pole functioned as predicted and allowed the car to pass under the pivoted section. The car was equipped with an air bag which deployed. The operator of the vehicle fled the scene of the accident on foot, without injury, but the vehicle was totaled. The pole was reset with the replacement of 4 straps and 2 bolts.

The second incident occurred when a Toyota 4 Runner hit a breakaway pole. It is projected that the truck impacted the pole at the passenger's side front tire. This would account for the amount of torque which caused the pole to fracture above the hinge. The truck was repairable.

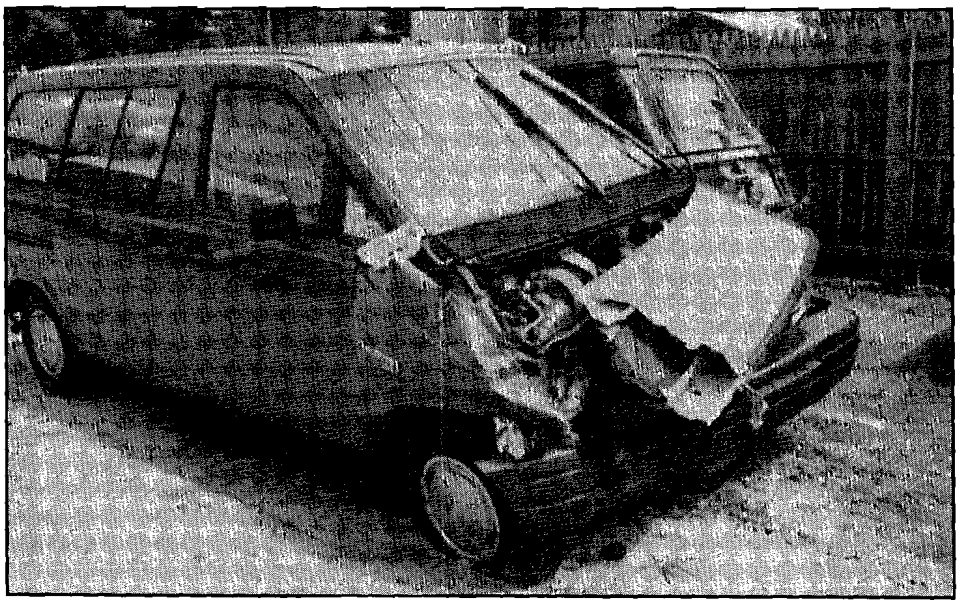
The third incident happened at the same pole as the second one. A Ford Aero Star Van hit the pole which activated as designed and swung back to rest about three feet from the base plate. The van sustained very little damage considering what could have occurred.

The fourth incident occurred when a Toyota pickup truck hit a pole. It is thought to have just struck a glancing blow as it passed the pole. This truck was totaled, but most of the damage was from rolling over and flipping instead of impacting the utility pole.

In all of these incidents, there were no serious injuries and no service interruptions. We will try to publish an update occasionally as events warrant. If anyone knows of suitable locations on Massachusetts State Highways please call Bob Gardner at (617) 973-7266.



This car impacted and actuated the pole. Estimated speed at time of impact was 70-75 mph.The driver walked away from this accident.



This van impacted and actuated the pole. (Notice that the windshield is intact.) This appears to be a lot of damage, but please keep in mind the fiberglass composition of the hood.

PUBLICATIONS

NEW LISTINGS

Using Additives and Modifiers in Hot Mix Asphalt Sections B, C, D and F from the National Asphalt Pavement Association. This publication has parts on Modifier Groups (including filler, extender, rubber, plastic, combinations, fibers, oxidants, antioxidant, hydrocarbon and antistrip), Miscellaneous Information (includes product summaries on silicone, verglimit, and Redicate AP), a Glossary and an Index.

IBC Median Barrier Demonstration (2/91) (FHWA-SA-91-006). This 29 page report documents the monitoring of 2,700 feet of IBC Mark VII median barrier. This barrier consists of two corrugated steel side panels and a steel lid which enclose a volume of sand or gravel.

The Design of Hot Mix Asphalt for Heavy Duty Pavements (5/86) Poorly designed Hot Mix Asphalt pavements which rut or fail have led some specifiers to believe that Hot Mix Asphalt can't perform well under extremely heavy traffic loads. However, airport runways built with Hot Mix Asphalt carrying loads in excess of 800,000 lbs. have performed quite well, as this publication points out in its chapters covering operational factors, materials selection, mixture design, and structural design of heavy duty pavements for highways, airports, railroad yards, logging yards, etc. - 16 pp.

Rehabilitated AASHTO Road Test (4/81) The AASHTO road tests were a milestone in pavement technology and design criteria. Not included, however, were tests on Full-Depth Hot Mix Asphalt, and this excellent study done for NAPA in 1980 not only shows how full-depth pavements have performed, but how they have compared to the PCC pavements built for the tests. - 24 pp.

CALENDAR OF EVENTS

July 8, 9, 11, 1991

Safety Workshop

Sponsored by the Baystate Roads Program, Department of Civil Engineering, University of Massachusetts/Amherst

This workshop will feature two speakers; Edward Bajakian from OSHA will speak on Trenching Safety Regulations and Philip Korman of MassCOSH will speak on Chemical Hazards and Road Work.

For further information watch for the next Baystate Roads Flyer or contact the Baystate Roads Program at (413) 545-5403.

October 9-11, 1991

Transportation Solutions for Small and Medium Sized Areas

Sponsored by TRB/NRC, FHWA, ITE, Vermont Local Roads Program and others

This is a national conference oriented specifically to the needs of transportation managers, planners, and engineers in small urban areas.

For further Information call Steven Gayle (607) 778-2443.

VIDEOTAPES

NEW ACQUISITIONS

PA-139
Idea Store V

From the Pennsylvania DOT. Produced March 26, 1991.

The latest version of the Idea Store has segments on proper tire inflation, safety grams, proper signing, adopt a sign, and the horrible hard hat.
(11 min.)

DC-132
GSB Emulsion

Distributed by Entac Northeast Inc.

An asphalt rejuvenating agent/sealer which can be applied with an asphalt distributor. GSB replaces vital oils and polar compounds lost in oxidations process and seals the asphalt. It does not need a sanding to absorb excess in many cases. Normally applied at a rate of 0.10 to 0.18 gallons per square yard of asphalt pavement.
(12 min.)

We are offering several publications (of which we have a limited supply). To receive a copy of any of the following: **Please check the appropriate box and mail this form** to: **Baystate Roads Program**, 214 Marston, Dept. of Civil Engineering, University of Massachusetts, Amherst, MA 01003 -- or call **Deborah Reiter (413) 545-5403.**

- ❑ ***Communications with your Board and the Public***
  Kate Skelton, Cornell Local Roads Program, 1988
  (Working with elected officials, the public, the media, and the crew)

- ❑ ***Gravel Paser Manual***
  University of Wisconsin, Madison, CE Dept., FHWA, 1989
  (Pavement surface evaluation and rating)

- ❑ ***Road Surface Management for Local Governments***
  Research Notebook; by FHWA, May 1985
  (A good source of blank forms and good background on what is available)

- ❑ ***The Vermont Backroads***
  Robert F. Longfield, Jr., 1974
  (A guide for the protection, conservation and enhancement of scenic quality)

- ❑ ***Techniques for Reducing Construction and Maintenance Costs***
  H. R. Thomas, D. Sweeney, E. D. Johnson
  PA DOT/FHWA, 1987
  (Value Engineering, drainage, road maintenance, shoulder maintenance)

- ❑ ***A Guide for Erecting Mailboxes on Highways***
  AASHTO, May 1984
  (Shows how to safely install mailboxes in the right of way)

- ❑ ***Quality Assurance for Local Governments***
  William R. Maslin, Louis B. Stephens, and James D. Arnarth, June, 1983
  (Hypothesizes that quality construction saves money for local governments)

- ❑ ***Our Nation's Highways; Selected Facts and Figures***
  FHWA, May 1989
  (Some useful facts about the country as a whole)

- ❑ ***Understanding Soil Compaction***
  CASE, 1986
  (What is compaction? Soil types, soil properties, moisture content, compaction factors, machine types, testing)

- ❑ ***The Snowfighter's Handbook***
  Salt Institute, 1982
  (A timely planning guide for sensible saltings next winter)

- ❑ ***Installation Manual for Corrugated Steel Drainage Structures***
  NCSPA, 1982
  (Locating, excavating, assembly of pipe culverts and sewers, back filling, subdrainage, skew diagram)

- ❑ ***Safety Restoration During Snow Removal; Guidelines***
  James Migletz, Jerry L. Graham, and Robert R. Blackburn
  FHWA
  (Cleanup during emergency snow removal operations should follow a priority ranking based on hazards)

- ❑ ***Local Highway Safety Studies***
  B. L. Bowman, Ph. D., P.E.
  DOT/FHWA/NHI, 1986
  (User's guide)

- ❑ ***Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)***
  ASTM, January 1989

Please see page 12 for additional publications.

Please fold (on line above) and mail.

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- ❑ ***Rating Unsurfaced Roads***
  R. A. Eaton, S. Gerard and D. W. Cate, US ACE, 1987
  (A field manual for measuring maintenance problems)

- ❑ ***Comparison of 3 Compactors Used in Pothole Repair***
  Michael A. Snelling and Robert A. Eaton, Nov. 1984
  (Asphalt concrete, compactors, potholes, repair, roads)

- ❑ ***Pothole Primer***
  Robert A. Eaton, Robert H. Joubert and Edmund A. Wright, U.S. ACE, 1989
  (A public administrator's guide to understanding and managing the pothole problem)

- ❑ ***Asphalt Paser Manual***
  Donald Walker, Lynn Entine, Susan Kummer, 1989
  (Pavement surface evaluation and rating)

- ❑ ***Model Pedestrian Safety Program; User's Guide***
  Richard L. Knoblauch and Kristy L. Crigler, FHWA
  (Discusses three types of counter measures to prevent pedestrian accidents: engineering, education and enforcement.)

- ❑ ***The Massachusetts Amendments to the Manual on Uniform Traffic Control Devices and the Standard Municipal Traffic Code January 1987***

- ❑ ***How to Manage Traffic During Highway Reconstruction***
  A.J. Nevew and L. Maynus, N.Y. DOT, 1985
  (Ideas on how to minimize impacts of construction)

- ❑ ***The Engineer's Pothole Repair Guide***
  Robert A. Eaton, Edmund A. Wright, William E. Mongeon US ACE, 1984
  (Potholes, materials for patching, tacking materials, sealing materials, patching equipment, repair procedures, pavement management)

- ❑ ***Traffic Control Devices Handbook***
  Part IV; Signals - FHWA

- ❑ ***Identification, Analysis and Correction of High Accident Locations***
  U.S. DOT/FHWA

Please see page 11 for additional publications, and reply card.

The Baystate Roads Program, which publishes *Mass Interchange* each quarter, is a Technology Transfer (T2) Center created under the Federal Highway Administration's (FHWA) Rural Technical Assistance Program (RTAP). FHWA is joined by the Massachusetts Department of Public Works, the Department of Civil Engineering at the University of Massachusetts/Amherst, and local public works departments in an effort to share and apply the best in transportation technologies.

In addition to publishing *Mass Interchange*, the Baystate Roads Program facilitates information exchange by conducting workshops, providing reports and publications and videotapes on request, and offering one-to-one technical assistance on specific roadway issues. Because the program relies on input from many sources, inquires, articles, and ideas are encouraged.

To contact the Baystate Roads Program, please call Silvio Baruzzi at (413) 545-2604.

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