

roads bridges transit technology news

Local Transportation Information Center
Iowa State University Engineering Extension Service

January 1984

Snow know-how

In general, there are 5 types of winter storms. Each requires a slightly different maintenance technique. Although most storms occur under conditions 1, 2, or 3 (see chart below), variations in temperature,

precipitation, or pavement conditions are likely to occur. Maintenance crews need to be well-trained for dealing with the unexpected.

The chart below is based on guidelines published in The Salt Institute's *Stormfighter's Handbook*.

Winter pothole patching

Repairing potholes during the winter season is extremely difficult. Problems of weather conditions and wet holes are compounded by the unavailability of hot mix asphaltic patching material. Because plants usually close from mid-November until May, street maintenance personnel are faced with patching potholes with less than desirable cold pre-mix asphalt material.

To fill this critical material need, many small communities are turning to commercial pre-mix patching materials sold in 5-gallon containers. These patching products vary greatly in quality and are extremely expensive. Per ton costs can run as high as \$300 to \$500.

To reduce the cost, small communities can combine their needs for cold mix patch material and order from a single supplier. Cold mix patch material prepared in a conventional hot mix plant markets for approximately \$30 per ton, depending on quantities received.

When purchasing cold mix materials, the street maintenance superintendent should look for these key properties:

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Condition	What to do
1 Temperature near 30°F. Precipitation snow, sleet, or freezing rain Road surface wet	For snow or sleet, apply salt at 500 lb. per two lane mile. Should snow or sleet continue and accumulate, plow and salt simultaneously. For freezing rain, apply salt at 200 lb. per two lane mile. Should rain continue to freeze, reapply salt at same rate.
2 Temperature below 30°F. or falling Precipitation snow, sleet or freezing rain Road surface wet or sticky	Apply salt at 300-800 lb. per two lane mile, depending on the rate of accumulation. As snow continues and accumulates plow and repeat application of salt. For freezing rain, apply salt at 200-400 lb. per two lane mile.
3 Temperature below 20°F. and falling Precipitation dry snow Road surface dry	Plow as soon as possible. Do not apply salt. Continue to plow and patrol to check for wet, packed, or icy spots. Treat these with heavy applications of salt.
4 Temperature below 20°F. Precipitation snow, sleet or freezing rain Road surface wet	Apply salt at 600-800 lb. per two lane mile, as required. Should snow or sleet continue and accumulate, plow and salt simultaneously. If the temperature starts to rise, apply salt at 500-600 lb. per two lane mile. Wait for salt to react before plowing. Continue until pavement is safe.
5 Temperature below 10°F. Precipitation snow or freezing rain Road surface accumulation of packed snow or ice	Apply salt at the rate of 800 lb. per two lane mile or salt-treated abrasives at the rate of 1,500 to 2,000 lb. per two lane mile. Plow when snow or ice becomes mealy or slushy. Repeat application and plow as necessary.

Note: The light, 200 lb. application recommended for Conditions 1 and 2 must be repeated often for the duration of the condition.

Workability—The mixture should be sufficiently workable for placement with shovels, rakes, or other hand tools. It should readily compact by hand tamping, hand or power rolling, or under the action of traffic at temperatures as low as 15°F. The mix should remain workable over a period of at least 6 months in a stockpile.

Stability—The mixture should remain in place when used to patch wet or dry pavements and should be stable under normal traffic loads.

Asphalt binder—The asphalt binder used in the aggregate mixture should be formulated with characteristics required to produce a mixture with workability, water resistance, compaction, and stability properties mentioned.

Typically, liquid asphalt binders are used for winter patch materials. These binders are formulated with

petroleum distillates to prevent freezing of stockpile mixtures. Asphalt contents of cold mix materials are high, averaging 7 percent. The increase in asphalt content for winter materials aids workability, density, and water resistance for cold weather applications. For cold mix materials, both MC and SC cutback asphalts are used. However, Des Moines has been very successful when using emulsified asphalt CMS-2 conforming to ASTM2397.

Aggregate—The aggregate mix formula should be open graded and low in fines. The open gradation will decrease the structural stability, but will greatly increase the winter workability. A well tested gradation exhibiting the necessary characteristics for winter patch material is as follows:

Sieve Size	Percent passing	
	Min.	Max.
½ in.	100	
¾ in.	90	100
#4	30	65
#8	14	30
#30	6	18
#200	1	5

It is too late this winter to combine with other cities, specify, and order cold mix patching materials. However, the local DOT resident maintenance office can be contacted to determine if patching materials are available from their stockpiles. In any case, for next year it would be wise to investigate a cooperative effort with other cities to purchase winter cold mix materials.

For a copy of specifications capable of being let for contract, contact Public Works Department, City of Des Moines, 515/283-4276.

John Bellizzi, P.E., Director of Public Works, Des Moines.

tips from — the field —

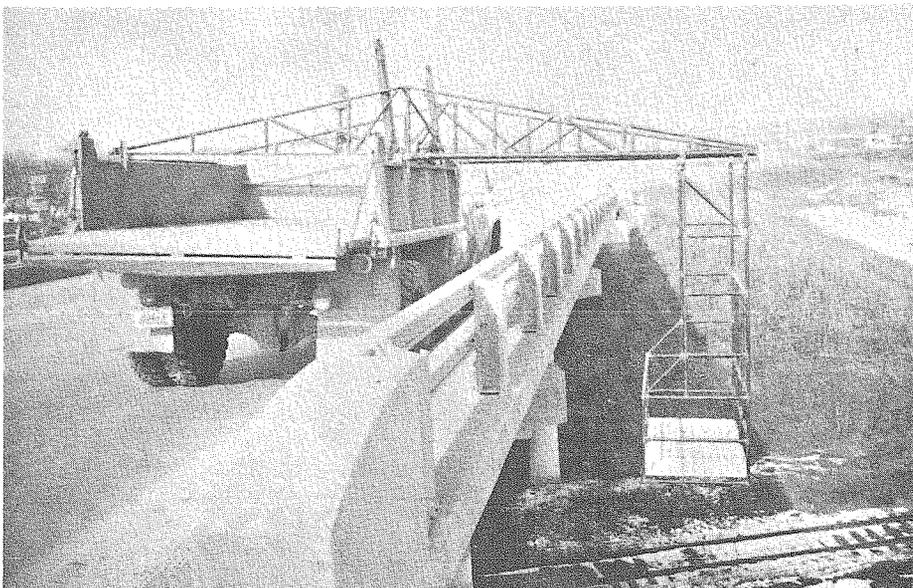
Bridge inspection, maintenance, and repair are constant problems for many cities and counties. Iowa DOT personnel have developed a helpful piece of equipment for bridge-related tasks. It is a portable bridge

maintenance scaffold that attaches to a standard dump truck.

The scaffold includes a work platform that is suspended over the bridge railing and extends under-

neath the bridge to allow for close inspection, painting, or other maintenance work.

A set of detailed plans for the scaffold may be obtained by calling the Info-Line or writing the Local Transportation Information Center. The scaffolding is rather large, but many local welding shops should be able to manufacture it.



Scaffolding for bridge work includes a work platform to aid inspection and maintenance tasks.

Technology News would like to hear from you. If you know of an innovative technique or piece of equipment that has been useful in your work, please share it with others. All you need to do is contact us and our staff will write up the necessary information for the newsletter. You may be instrumental in solving a problem for someone else. Contact Dave Dickinson, Local Transportation Information Center, 110 Marston Hall, ISU, Ames, Iowa 50011.

Water blasting holds promise for bridge repair

New equipment demonstrated recently by the FHWA could replace the jackhammer for removing deteriorated concrete from the tops of bridge decks.



The equipment uses high pressure cavitation water jets to get the job done six to eight times faster than a jackhammer. Water at up to 20,000 psi pressure is supplied by a commercially available large diesel pump. Actual removal is done by a small, independently powered, specially designed unit that is connected to the pump by a high strength hose.

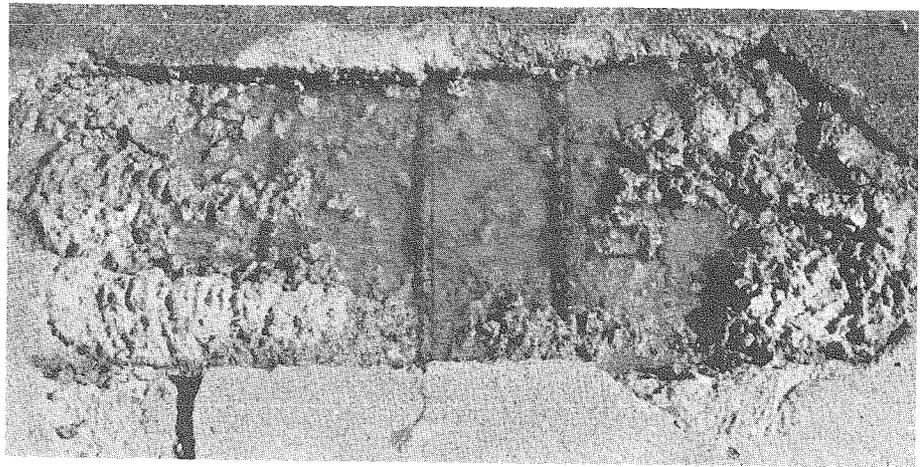
The unit has two pairs of rotating cavitation water jets on the bottom that direct the water downward and slightly outward. Concrete is removed in a band about 12 inches

wide. The depth of the removal is a function of the forward travel speed and the pressure with depths of 3 inches common.

The economics of this procedure are not yet clear. The pump alone costs \$135,000. However, the FHWA reports removal rates of up to 11 cubic feet of concrete per minute.

Although some developmental work remains, this new procedure might be of value in Iowa's bridge repair program.

John G. Risch, maintenance bridge engineer, Highway Division, Iowa DOT.



Concrete is removed in a strip about 12 inches wide and as much as 3 inches deep.

The FHWA recently demonstrated new equipment that uses high pressure water jets to remove deteriorated concrete up to eight times faster than a jackhammer.

conference 1 2 3calendar

For more information about these conferences, call the Info-Line.

Asphalt Paving Conference Jan. 24, ISU

Topics—Applications of asphalt for pavements, design, construction, and maintenance of facilities.

PACE Construction Supervisory Training—

Leadership and Motivation Jan. 26-28, Des Moines

Topics—Leadership styles, poor performance causes, understanding on-the-job behaviors, developing skills to solve problems with people and for gaining commitment, the leader as goal setter, communicator, and

coach. Designed to help improve skills of superintendents, contractors, and other supervisors. Fee \$175.

County Engineers Workshop: Court- room Procedures

Jan. 30, ISU

Topics—Tort liability and procedures for county engineers serving as expert witnesses.

Iowa DOT Transportation Conference Feb. 2-3, ISU

Topics—Update on various methods of transportation for the engineers and administrators of the Iowa DOT.

County Engineers Workshop: Bridge Rehabilitation

Feb. 13-15, ISU

Topics—Techniques for rehabilitating older bridges, rating bridge trusses, and inspecting bridges.

APWA Public Works Conference March 7-8, ISU

Updated information and technical aspects of public works.

Design of Urban Streets March 12, Council Bluffs March 14, Ankeny

For engineers, technicians, and others concerned with planning, design, and operation of urban streets. Detailed course notes provided.

And justice for all

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the FHWA structure number from the inspection form, the street name, and the stream or river crossed. The letter should be sent to the Office of Local Systems, Iowa DOT, Ames, Iowa 50010.

In August each year, after inspection reports have been returned, the DOT Local Systems Office prepares a priority list of all city requested candidate projects. Priority is based on structure sufficiency rating, traffic volume, potential detour out-of-distance travel, and posted load limit. Sometime after October 1, when the next fiscal year apportionment of federal aid is usually made available to the state, cities at the top of the priority list are notified that funds are available for their project.

Funding conditions

A city applying for federal funds for a project should be aware of these additional program conditions:

1. This is a reimbursement rather than a grant program. In other words, a city must initially fund the work, and subsequently will be reimbursed for the eligible parts of the project identified in the agreement.

2. Funding is on an 80 percent federal/20 percent local basis for the contract construction cost. Cities are responsible for right-of-way and design/construction engineering costs, except on large projects where the engineering costs may be a participating item.

3. When a city accepts funding from the program, it is expected to initiate project development in a timely manner. For example, if a city accepts a funding agreement in late 1983 or early 1984, it is expected plans will be completed for a letting no later than late 1984 or early 1985 for 1985 construction. Of course, if a project can be let for 1984 construction, that

is all the better. If a city cannot meet this schedule, it will be asked to stand aside so that a city farther down the list that is ready and capable of meeting the schedule can take advantage of the program. The first city's bridge will be kept on the priority list for evaluation authorized by Congress through fiscal year 1986.

If a city wishes to check on the status of its bridge (or bridges) with respect to the inventory or inspection, call Stan Johnson, (515) 239-1064. To learn more about the acts and conditions relating to the program and the priority list, call Harold Schiel, (515) 239-1412. The mailing address is Office of Local Systems, Iowa DOT, 800 Lincoln Way, Ames, Iowa 50010.

Harold Shiel, P.E. urban systems engineer,
Office of Local Systems Iowa DOT.

Traffic Control Device Handbook Available

The Local Transportation Information Center and the Iowa DOT's Local Systems office have available at reduced price the new **Traffic Control Device Handbook**.

Primarily intended to augment the **Manual on Uniform Traffic Control Devices (MUTCD)**, the handbook offers guidelines for implementing MUTCD's standards and applications. The **MUTCD** is the official standard for use on all streets and highways open to public travel.

The new handbook provides information related to the fundamental concepts of traffic regulation and control, traffic control devices, current application practices, and promising traffic engineering techniques of the future. Sections included in the handbook are signs, markings, signals, islands, work zone traffic control, school areas, railroad highway grade crossings, and bicycle facilities. Each section defines the types and purposes of the devices and identifies appropri-

ate driver/pedestrian response. Preinstallation studies and decisions, installation, and operations and maintenance are covered in detail in each section.

According to the DOT, a half-day seminar on application of the handbook is being planned for early spring.

The **Traffic Control Device Handbook** may be ordered from the Local Transportation Information Center. For cities with populations greater than 50,000 and for DOT employees, the price is \$15. For cities of less than 50,000 and for counties, the price is \$5. To order, complete the form and mail it with a check for the appropriate amount to our office.

Traffic Control Device Handbook

Name _____ Title _____

Department _____ Address _____

City _____ State _____ Zip _____

Check enclosed for:

_____ \$15.00 (cities over 50,000, DOT employees)

_____ \$5.00 (cities less than 50,000, counties)

Make check payable to: Engineering Extension Service

Return to the Local Transportation Information Center, 110 Marston Hall, ISU, Ames, Iowa 50011.

Federal bridge funds for cities

Iowa has approximately \$38,600,000 available for federal-aid bridge replacement and rehabilitation projects in fiscal year 1984 (October 1, 1983, through September 30, 1984). The current formula for division of these funds is 47 percent county, 45 percent state, and 8 percent city. This formula was established through joint meetings involving city, county, and state representatives, and is based on comparative needs determined through inspection of bridges on all streets and highways.

Program procedures

City representatives proposed the following procedures for administration of the cities' allocation of the federal funds:

1. Ten percent of the total city share be reserved for rehabilitation projects with a single project ceiling of \$100,000.
2. The remaining 90 percent of the cities' share be used for replacement projects with a single project ceiling of \$650,000.
3. Cities failing to meet inspection requirements for all bridges on their street system shall not be eligible to receive federal-aid funds for their project.

It is evident from number 3 (above) that bridge inspection is a key to participation in this program. First, federal law **requires** inspection of all structures on public streets and highways at least once every 2 years (on a 2-year cycle unless deterioration dictates a more frequent schedule). The Iowa share of federal funds is determined on the basis of Iowa needs compared to the needs for all states as registered with the Federal Highway Administration (FHWA) through the required inspection process. Agencies that do not perform the required inspections do not earn money for the Iowa program, and therefore, should not expect to be eligible to participate.

The cities, regardless of size, are responsible for inspection of bridges on streets within the corporate limit boundaries. The State DOT is not staffed to do inspection work on local, city, and county streets and highways. The county engineer may provide assistance, but is not required to do so. A city that has no engineering staff, but is in need of inspection work to be done, should first contact its county engineer. The county engineer either may be able to provide assistance, subject to county policy, or may suggest a qualified consultant engineering firm (or firms).

Inspection reports

All bridges on all streets and highways have been recorded in the Iowa DOT computer bridge file record. Each year, on or about September 1, the DOT prepares and disseminates the necessary Structural Inventory and Appraisal (SI&A) forms that must be used when an inspection is made. Forms will be sent out only for bridges that require inspection or reinspection. Cities with a population of 5,000 or greater will receive the forms directly. Cities below 5,000 in population will receive the forms through their county engineers. If the forms are not delivered by the county, the city should contact the county engineer's office and make arrangements for pick up or delivery. The completed forms must be returned to the Iowa DOT **no later than July 31** of the following year. This allows approximately a 10-month period for the work to be done. The original forms **must** be used. Xerox copies or older forms cannot be processed.

Once the inspection work is done, a city is eligible to participate in the program. The city may request participation when the inspection forms are returned, or at any time the need arises or the city is determined to proceed with a project. The bridge (or bridges) should be identified by

Board oversees highway research

The Iowa Highway Research Board is a 13-member advisory board established in 1949. The board assists Iowa DOT's Highway Division with the development and continuation of an effective, coordinated, and progressive research program.

The board is composed of six county engineers, two engineers from municipalities, two engineers from universities, and three engineers from the Highway Division. Each member serves a 3-year term, usually following the service of a 3-year term as alternate.

During 9 monthly meetings held in fiscal year 1983, the board reviewed and recommended the initiation of

20 research projects with a funding recommendation of \$1,380,000.

Research final reports recently accepted by the board are now available upon request:

Characterization of Fly Ash for Use in Concrete, HR-225; *Design Criteria for Low Water Crossings*, HR-247; *Joint and Crack Sealing with Various Sealants*, HR-203; *Experimental Use of Calcium Magnesium Acetate (CMA)*, HR-253.

A complimentary copy of these and other research reports may be obtained by contacting Vernon J. Marks, research engineer, Office of Materials, Iowa DOT, Ames, Iowa 50010.

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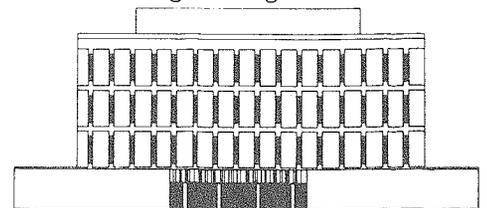
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civil engineering extension



for more information

The Hole Story

Published by the American Public Works Association

Available free from the Info-Line

The Hole Story is a pamphlet that can help local officials and community leaders present the engineering facts about local street maintenance. The easy to understand question and answer format is well illustrated. Discussions of the causes of potholes and maintenance strategies and costs can help keep citizens informed about the issues involved in street maintenance policies.

Mobility and Safety

City of Des Moines Snow and Ice Control Program

Available free from John Bellizzi, P.E., Des Moines Public Works Department

This 8-page booklet gives a brief synopsis of the operational phases in Des Moines' snow and ice control program. Ice removal, street and sidewalk snow removal, mobilization procedures, and personnel and equipment are among the subjects covered.

A Checklist for Improving Pedestrian Safety in Your Community

Available for \$1 from the Highway Users Federation for Safety and Mobility and The Automotive Safety

Foundation, 1776 Massachusetts Ave. NW, Washington, D.C. 20036

This informative checklist of questions can help identify strengths and weaknesses in a community's pedestrian safety program and provide direction for program improvement. It offers a compilation of policies and practices that have proven effective.

Maintenance of Joints and Cracks in Concrete Pavement

Patching Concrete Pavement

Published by the Portland Cement Association

Available free from the Info-Line

These two companion reprints offer excellent descriptions of concrete pavement maintenance practices. Maintenance of Joints and Cracks deals with resealing joints, sealing cracks, repairing spalls and spalled joints, and correcting faulted joints by grinding. Patching Concrete Pavement addresses full-depth in-place patching, full-depth precast patching, surface patching of jointed pavements, and patching of continuously reinforced concrete pavements.

Compilation of States' Laws and Regulations on Matters Affecting Rail-Highway Crossings

Published by the Federal Highway Administration and the Federal Rail-

road Administration

Available from the Info-Line

This government publication is intended as a reference tool for those working in the rail-highway crossing field. It contains state laws, ordinances and regulations pertaining to rail-highway crossings, and is organized by state, key word, and subject. The manual should be useful in assessing differences among states and in making comparisons to the Uniform Vehicle Code.

Large Vehicle Off-Tracking

Published by AASHTO

Available free from the Info-Line

This publication provides the turning paths of large vehicles and is a useful source of information in the design and construction of driveways and intersections.



Transportation Info-Line

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1-800-262-8498

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