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Iowa State University's Center for Transportation Research and Education (CTRE) is the umbrella organization for the following centers and programs:

Bridge Engineering Center
Center for Weather Impacts on Mobility and Safety
Construction Management & Technology
Iowa Local Technical Assistance Program
Iowa Statewide Urban Design and Specifications
Iowa Traffic Safety Data Service
Midwest Transportation Consortium
National Concrete Pavement Technology Center
Partnership for Geotechnical Advancement
Roadway Infrastructure Management & Operations Systems
Sustainable Transportation Systems Program
Traffic Safety and Operations

ctre

Center for Transportation
Research and Education

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Reducing water pollution through stormwater BMPs

Chemicals, bacteria, metals, dirt, and trash collect on hard surfaces in urban areas. Stormwater picks up these contaminants and carries them into our stormwater systems. The stormwater systems discharge into waterways, resulting in water pollution.

Stormwater quality best management practices (BMPs) are tools you can use to help reduce water pollution caused by urban stormwater runoff. Designed and constructed properly, BMPs are capable of removing most of the pollutants.

Types of BMPs

There are two types of stormwater BMPs: structural BMPs and non-structural BMPs. Structural BMPs include engineered and constructed systems that control the quantity and/or quality of stormwater runoff. Non-structural controls include public education, recycling, and maintenance practices.

Structural BMPs

- **Infiltration systems** capture stormwater

runoff and release it into the ground. Generally infiltration basins are used in conjunction with filtration systems, which use sand, soil, carbon, and other organic materials to remove debris from runoff before it is released into the ground.

- **Detention basins** capture runoff and temporarily detain it to be released into the ground at a later time. Detention systems do not reduce the total volume of runoff from a storm, since all of the runoff is eventually released. The goal of detention systems is to reduce the rate at which water flows downstream during the peak of a storm.
- **Stormwater ponds** capture runoff and retain it for an extended period of time—usually 24 to 48 hours. The retained volume is either lost to evaporation, infiltrated into the soil profile and then to the water table, or is subsequently withdrawn for non-potable reuse.
- **Bioswales** are vegetated, open-channel systems designed to improve stormwater quality. As runoff flows along these channels, it is treated

Reducing water pollution continued on page 2



A bioswale captures stormwater runoff and filters it through the soil system (photo courtesy of NRCS).

Acronyms in *Technology News*

AASHTO	American Association of State Highway and Transportation Officials
APWA	American Public Works Association
CTRE	Center for Transportation Research and Education (at ISU)
FHWA	Federal Highway Administration
Iowa DOT	Iowa Department of Transportation
ISU	Iowa State University
LTAP	Local Technical Assistance Program
MUTCD	Manual on Uniform Traffic Control Devices
NACE	National Association of County Engineers
TRB	Transportation Research Board



U.S. Department of Transportation
Federal Highway Administration



Iowa Department
of Transportation

LTAP is a national program of the FHWA. Iowa LTAP, which produces this newsletter, is financed by the FHWA and the Iowa DOT and administered by CTRE.

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Reducing water pollution continued from page 1

through vegetation slowing the water to allow sedimentation, filtering, and/or infiltration into the underlying soils.

- **Rain gardens** are landscaping features adapted to provide on-site treatment of stormwater runoff. Surface runoff is directed into shallow, landscaped depressions, where it is filtered through the mulch and specially prepared soil mix.
- **Permeable pavements** are designed to allow stormwater runoff to infiltrate directly through the pavement into the soil system, where contaminants can be filtered out. Examples of permeable pavements include porous asphalt and pervious concrete.

Non-structural controls

- **Public education and recycling** can be effective in reducing the amount of non-point source pollutants that enter a stream. Citizens are often unaware that their day-to-day activities can cause significant non-point source pollution problems. Components of a public education program to reduce pollution include the following:

- Automotive product disposal
 - Pesticide/herbicide use
 - Fertilizer use
 - Household hazardous material disposal
 - Lawn debris management
 - Pet waste disposal
- **Maintenance practices** are important in order to reduce pollution from the urban landscape and to ensure that stormwater collection and treatment systems are operating as designed. Maintenance practices can include the following:
 - Cleaning catch basins
 - Sweeping streets and parking lots
 - Maintaining roads and ditches
 - Limiting road salting and sanding
 - Removing sediment from BMPs
 - Maintaining vegetation

For more information

For more information on implementing stormwater BMPs in your community, consult the Iowa Stormwater Management Manual, available through CTRE at www.ctre.iastate.edu/pubs/stormwater/ ■



A rain garden is a flexible and aesthetic solution where a landscaped area collects surface runoff and then filters it through a variety of plants and a specially engineered soil mixture (photo courtesy of NRCS).

Not-so-new urban specifications for Iowa DOT

Cities that have wanted to use the Statewide Urban Design and Specifications (SUDAS) guidance for federally funded transportation projects let by the Iowa DOT will soon be able to do just that.

In 2009, the Iowa DOT will incorporate sections of the SUDAS Specifications Manual related to utility installation, including sanitary sewers, storm sewers, and water mains, into the Iowa DOT Standard Specifications.

This means that the specifications for materials and processes will be the same for city and state projects, which should lead to lower bids and faster completion of projects.

One set of specifications

“Contractors will be able to rely on one set of specifications and suppliers will be able to keep one set of supplies on hand for a particular type of project,” says SUDAS Director Larry Stevens. “This uniformity and standardization, from the contractor’s and supplier’s standpoint, is invaluable.”

The current DOT specifications focus mainly on rural work, with a strong emphasis on areas such as grading and paving. Topics of interest to urban communities, such as underground and utility work, are given only brief coverage in a miscellaneous section.

The lack of sufficient guidance on underground and utility installation poses a problem for many cities, since cities are required to use the DOT specifications, rather than SUDAS, for any projects that are federally funded and let by the Iowa DOT. Without specific guidance, cities must create special provisions for each project on an individual basis. This poses a problem for contractors, who are constantly forced to adapt to special provisions for different projects, and suppliers, who may need to have a myriad of products on hand.

Developing the new specifications

The integration of the Iowa DOT and SUDAS specifications began in 2004, when the Iowa Highway Research Board (IHRB) funded a project to identify differences between the DOT and SUDAS specifications. Two years later, IHRB funded another project to reconcile those differences.

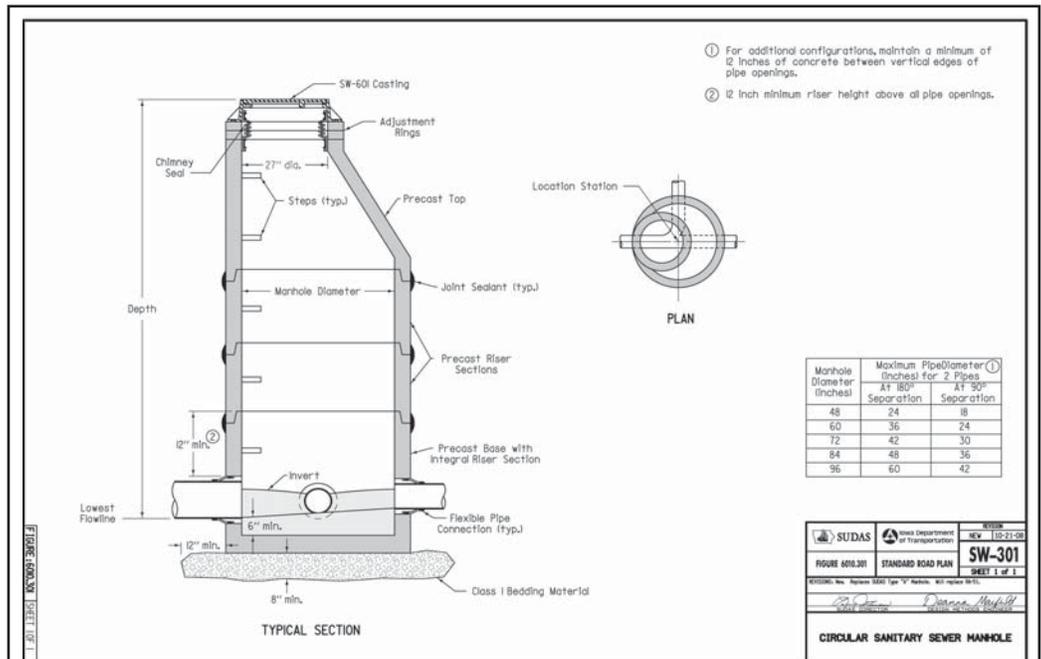
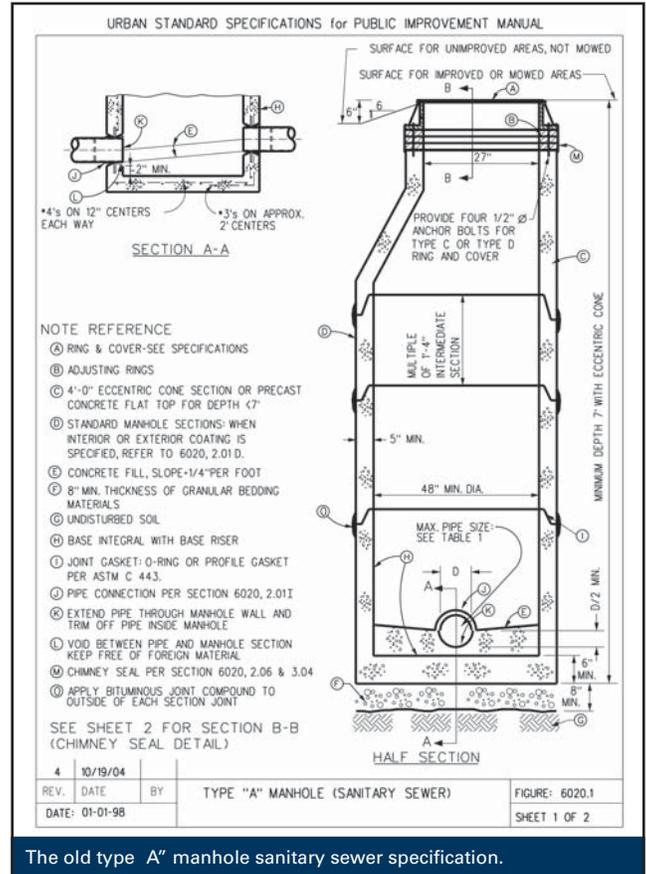
SUDAS will issue its newly revised specifications this fall, and the Iowa DOT will follow suit in 2009. Stevens believes the new specifications will simplify construction processes for everyone involved.

For more information

For more information, contact SUDAS Program Coordinator Beth Richards, 515-294-2869, brich@iastate.edu. ■

SUDAS - Statewide Urban Design and Specification

CTRE maintains Iowa’s unique SUDAS manuals for public improvements. Developing and maintaining the SUDAS manuals is the result of a lengthy and painstaking effort by more than 300 stakeholders across the state.



Iowa LTAP Mission

To foster a safe, efficient, and environmentally sound transportation system by improving skills and knowledge of local transportation providers through training, technical assistance, and technology transfer, thus improving the quality of life for Iowans.

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Shop focus: Mowing operations

Timely mowing is an important aspect of any vegetation management program to help control tree and brush growth and to reduce invasive species and snow drifting. It may also help reduce animal-related collisions.

That said, safety education for mower operators is an important and rewarding responsibility for local agencies. Following are some tips to help you increase mowing operations safety and efficiency.

Alert road users to mower operations

Key to operator safety is public awareness of mower operations. A “Mowing Ahead” (or similar warning) sign used in advance of the work zone on the right-of-way will help alert drivers about mowing operations.

Inspect work area and identify risks

Before operating equipment, workers should examine the work area and identify and remove potential projectile objects that could endanger passers-by and operators or damage mowers. Obstacles such as tree stumps or culvert ends should be marked with flags that can be easily identified by the mower operator.

More than half of mower-related accidents result from rolling the machine because

an operator attempted an unnecessary risk of mowing on uneven ground or a dangerously steep slope. To prevent such risks, always follow manufacturers’ recommendations for working on slopes. Risk is also minimized when mowers are equipped with a rollover protective structure and a seat belt.

Evaluate equipment regularly

All equipment should be evaluated at the start of each work day to ensure proper working conditions. Regular inspections and maintenance are critical to public and operator safety as well as equipment operation and service life.

Personal protective gear should also be inspected regularly and repaired or replaced as necessary. Protective gear such as hard hats, ear protection, heavy gloves, and boots should always be worn properly to minimize operations-related risks.

Supervisors should be notified when potential work-zone hazards or unsafe operating practices are identified.

Role of support vehicles, when needed

Support vehicles play an important role in improving work-zone safety for mower operators by alerting the public to vegetation management activities, cleaning up debris, and pruning and weed whacking areas difficult and unsafe for mower operators to reach. ■



Operator safety is an important aspect of vegetation management for local agencies (photo courtesy of Ryan Weidemann, Webster County Engineer's Office).



LTAP 25th Anniversary

Focus on special events and programs

Unique programs and special events have made Iowa's LTAP well known throughout the state. These programs give Iowa workers the opportunity to showcase their skills and hard work, and to earn recognition for their achievements.

Showcasing skills: The Snow Plow Roadeo

In October 1990, Iowa LTAP began working with the Iowa Chapter of the APWA to hold an annual Snow Plow Roadeo that consisted of a written test, a visual equipment inspection test, and a five-event driving course.

The Snow Plow Roadeo was initiated by Clive Public Works Director Willard Wray, who was familiar with a similar program in Colorado, and saw the opportunity for Iowa drivers to compete as well.

"Willard was a very educationally minded public works director who wanted his people to be the best at what they did," says Jim Cable, retired ISU associate professor of civil and construction engineering, who coordinated the Snow Plow Roadeo for many years.

"A lot of the things going on today at LTAP—the Maintenance Expo, Motor Grader Roadeo—those grew out of the Snow Plow Roadeo and Willard's hard work on it."

The Snow Roadeo expanded over the years. A Motor Grader competition was added in 1998 and a Loader competition was added in 2006.

Building on success: The Iowa Maintenance Training Expo

The success of the Snow Plow Roadeo and the demand for winter maintenance training led to the development of the first Winter Training Expo in October 1997. The three-day event consisted of the traditional Snow Roadeo and two days of educational sessions. The expo also included displays and demonstrations of equipment, materials, and services by vendors from around the country.

In 1999, the expo transformed into the all-season Iowa Maintenance Training Expo. Educational sessions at the expo have included deicing, tree trimming, propane safety, and more. The expo is now held every other year, with a Winter Maintenance Training workshop held in the off years.

In 2001, the "Build a Better Mousetrap" competition was introduced at the expo. "Better mousetraps" include tools, equipment modifications, and systems that public agency personnel have created to make their jobs safer, easier, and less costly. Six winners are selected each year.

Recognizing achievement: The Roads Scholar Program

In 2002, Iowa LTAP implemented the Roads Scholar Program, a new training tool to recognize transportation workers who demonstrate a commitment to continuing education.

"Roads Scholar is the only program for non-professionals at the local level that recognizes them for their accomplishments," says Iowa LTAP Director Duane Smith. The program gives participants credit for each LTAP training session or workshop they attend.

Snow Roadeo and Winter Maintenance Training

This year's Snow Roadeo and Winter Maintenance Training workshop will be held on September 10-11, 2008 at the Iowa Speedway Complex in Newton.

For registration information, contact Georgia Parham, 515-294-2267, gparham@iastate.edu.

More than 14,000 Iowa employees have participated in the Roads Scholar Program since its inception. Participants can visit the Iowa LTAP website to track their progress through the program. This also provides supervisors with a tool to help them schedule and track employee training.

To make training sessions even more convenient, Iowa LTAP has partnered with Engineering Distance Education at Iowa State University to offer some Roads Scholar courses online. Supervisory Skills and Techniques, the first course to be offered online, is now available.

For more information

For more information about the Snow Roadeo, Maintenance Training Expo, or Roads Scholar Program, contact Duane Smith, 515-294-8817, desmith@iastate.edu.

Visit the Roads Scholars Program at www.ctre.iastate.edu/roadscholar/. For more information about the online Supervisory Techniques and Skills course, visit www.ede.iastate.edu/Non-Credit/Management/Supervisory-Techniques-and-Skills.html. ■



Participants in the Snow Plow Roadeo compete in a five-event driving course.

Complete streets: Improving the health and safety of your community

In 2007, 23 pedestrians and seven bicyclists were killed in traffic accidents in Iowa. More than 500 pedestrians and 400 bicyclists were injured. To improve travel safety for pedestrians and bicyclists, many cities around Iowa and the nation are adopting complete streets policies in the design of their streets and roads.

In addition to improving travel safety, complete streets improve the health of both the community and the people living in it. By encouraging people to walk and bicycle, complete streets can reduce carbon dioxide emissions and ease traffic congestion. Increased walking and bicycling also lowers the risk of obesity and the host of health problems that come with it.

Finally, complete streets encourage people to get out of their houses, meet their neighbors, and take pride in their community—something that many neighborhoods lack in our high-tech society. And complete streets policies may soon be required by law (see sidebar, page 7).

What is a complete street?

A complete street is safe, comfortable, and convenient for travel via automobile, foot, bicycle, and transit.

Traditional road design has focused on moving high volumes of motor vehicle traffic as quickly and efficiently as possible. Complete streets aim for lower volumes of motor vehicle traffic moving at slower speeds, which leads to less traffic congestion and improved pedestrian safety. Complete streets also have walkways and bike lanes for pedestrians and cyclists that provide separation from traffic.

What makes a street complete?

Sidewalks

Complete streets have sidewalks that are at least four (and preferably five) feet wide, with an additional space separating pedestrians from motor vehicles in the right-of-way. The area providing separation is frequently a utility strip landscaped with grass, trees, and other vegetation. On-street parking can also effectively separate pedestrians from moving vehicles. At crossings, sidewalks should have curb ramps to make the crossing accessible for wheelchairs and strollers.

Crosswalks

Crosswalks can occur at intersections or mid-block. Mid-block crosswalks should always be delineated with pavement mark-

ings. Crosswalks at intersections should be strategically marked in accordance with the MUTCD. The MUTCD generally recommends the use of marked crosswalks at

- designated school crossings,
- locations where there is a high volume of pedestrian traffic combined with a high volume of vehicular traffic, and
- locations where there may be confusion due to unusual geometrics or traffic operations.

Crosswalk refuges (or median islands) are another option for complete streets. By breaking the crossing into two segments, crosswalk refuges allow pedestrians to focus on one car movement at a time.

Other elements of crosswalk design that can be useful for improving pedestrian safety and accessibility are no-right-turn-on-red signs, countdown signals that let pedestrians know how much time they have to complete the crossing, and in-street “pedestrian crossing,” “stop,” or “yield” signs.

Bicycle lanes

Re-striping the road to create bike lanes is an inexpensive complete streets solution. AASHTO recommends that bicycle lanes



Well-marked bicycle lanes improve travel safety for bicyclists on this high-speed arterial roadway in Ames (photo courtesy of Bradley Grefe, CTRE at ISU).



Complete street sidewalks should be four (and preferably five) feet wide, and should have curb ramps at crossings to be accessible to wheelchairs and strollers (photo courtesy of Bradley Grefe, CTRE at ISU).

be four feet wide when in an open space and five feet wide when next to a curb or parking.

The diamond symbol is no longer used for bicycle lanes. It caused confusion since the diamond symbol is also used for high-occupancy vehicle lanes. The new bicycle lane sign is pictured on page 6. Replace the old signs (and pavement markings) through your city's or county's regular sign maintenance schedule.

Shared lane markings

When a street has insufficient space for a bicycle lane, a shared lane marking is a potential complete streets solution. Shared lane markings are currently being experimented with or used in over 20 cities in the United States. The optimum use of this treatment is on streets with lower speeds. It is not an adequate solution for high-speed suburban arterial roadways.

Transit-friendly features

Bus shelters and pull-outs can make public transit more convenient and accessible for a variety of users. These features are particularly important for high-boarding stops, especially on high-volume roads. Concrete pads with benches and sidewalk

connections can also improve the quality of a moderate-use transit stop. Incorporating trees, lighting, benches, and art can help make a stop attractive and inviting.

For more information

For more information about complete streets and how to incorporate them into your community, visit www.completestreets.org. ■

The Complete Streets Act of 2008

In March 2008, Senator Tom Harkin of Iowa introduced The Complete Streets Act of 2008 to promote streets that are safe, comfortable, and convenient for motorists, bus riders, bicyclists, and pedestrians, including those with disabilities.

If passed, the bill will require that all new construction and reconstruction projects include complete streets policies in their design. For example, if a road is being resurfaced, the new bill could mean that the city or county would have to include a bicycle lane, paved shoulder, or shared-lane marking on the newly surfaced road.

Free web-based concrete materials training available through the National Highway Institute

The National Highway Institute and the Transportation Curriculum Coordination Council are sponsoring free web-based training workshops on Hardened Concrete Properties—Durability (FHWA-NHI-134075). ISU's National Center for Concrete Pavement Technology designed the training based on its manual, *Integrated Materials and Construction Practices for Concrete Pavement (IMCP)*.

The training is intended to help industry practitioners and FHWA, state, and local agency personnel better understand the factors involved in concrete pavement durability. Topics will include permeability, alkali-silica reaction, abrasion resistance, and other durability factors, as well as durability testing methods. Other IMCP modules will be available as they are converted to web-based training.

Registration is available at no charge at www.nhi.fhwa.dot.gov. The training is available to the public and lasts approximately one hour. Contact Ann Gretter, 703-235-1260, ann.gretter@fhwa.dot.gov, for additional subject matter information or Chris Newman, 202-366-2023, christopher.newman@dot.gov, with other questions. ■

Rumble stripes may increase rural roads' safety

Edge line paint can lose its visibility after several months of service. CTRE researchers are evaluating whether edge lines painted over rumble strips, otherwise known as rumble stripes, will improve edge line paint durability and visibility.

Rumble stripes have been installed on six county road sites as part of a research project that seeks to reduce the incidence and severity of run-off-road crashes. Test sites were chosen based on the Iowa DOT's list of the top five percent of road sections for run-off-road crashes from 2001–2006. Most test sections are on horizontal curves.

A research team led by Shauna Hallmark, ISU associate professor of civil, construction, and environmental engineering, and Tom McDonald, CTRE safety circuit rider, will investigate. The project is sponsored by the Iowa DOT, the Iowa Highway Research Board, and FHWA.

Research objectives

"We're mainly looking for increased visibility of the paint line," says McDonald. "Increased noise or vibration from the rumble strip is a side benefit." During the first year after installation, the team will investigate the following:

- Wet weather visibility of rumble stripes versus traditional edge line painting
- Long-term durability of the painted edge line
- Driver travel distance from the edge line before and after installation of rumble stripes

An additional period of at least five years will be necessary to collect and analyze crash data valid for comparison with data collected before the installation of the rumble stripes.

Differences between rumble strips and rumble stripes

Standard shoulder rumble strips in Iowa are 16 inches wide and are installed on the paved shoulders of state-owned roads. Rumble stripes add a four-inch-wide painted edge line on the milled surface. The depth of both rumble strips and rumble stripes is similar, about $\frac{1}{2}$ to $\frac{5}{8}$ inches.

Since most of Iowa's county roads don't have paved shoulders, for this project four-inch rumble strips were milled into the lane edge and then painted over.

County roads included in the study

With the welcome cooperation of the county engineers, road sections being evaluated as part of this project include W-13 in

Buchanan County, P-53 in Dallas and Madison Counties, F-70 in Polk County, F-29 in Poweshiek County, and B-30 in Sioux County.

For more information

For more information about this project, contact Tom McDonald, CTRE Safety Circuit Rider, 515-294-6384, tmcdonal@iastate.edu. ■

Table 1. Differences between rumble strips and rumble stripes

	Rumble strips	Rumble stripes
Type of shoulder	Paved	Unpaved
Location	On the shoulder	On the edge line
Width	16 in.	6 in. (maximum)
Paint	Unpainted	4 in. painted edge line



Milled-in rumble strips are applied to a county road, which will soon be painted over with edge line striping resulting in a "rumble stripe" (photo courtesy of Bob Sperry, Iowa LTAP).

Finding the ideal hot mix asphalt pavement mixture

A clear, thorough guide for selecting hot mix asphalt (HMA) pavement mixtures based on current gyratory compaction technology (SuperPave) saves time and energy for engineers and technicians who are involved in specifying HMA paving material for local projects. The Statewide Urban Designs and Specifications (SUDAS) program has provided such a guide in their design manual.

Section 5D-1 (HMA Pavement Mixture Selection) of the SUDAS Design Manual was adapted from Iowa DOT design guidance for local agencies. The Iowa DOT guide did not provide sufficient direction for the unique characteristics of urban areas, such as slower speed, stopping and turning traffic, urban truck volumes, and high traffic volumes. SUDAS tweaked the guide so it is useable for both rural and urban areas.

Michael J. Kvach, executive vice president of the Asphalt Paving Association of Iowa, says that before SUDAS's guide, local agencies and consulting firms around the state all had various processes for making mixture selection. "This obviously made for real problems in the consistency of pavement performance around the state," he says.

"With [the guide's] proliferation across the state," Kvach says, "improperly designed HMA pavements should become a thing of the past."

The guide makes it clear what needs to be calculated in order to decide on the best HMA pavement mixture for any situation. Factors to be calculated include the daily average number of trucks on a street, daily equivalent single axle loads (ESALs), layer designation, and a few other criteria.

Design checklist

By following the easy, step-by-step procedure below, pavement designers can make proper HMA mixture selections based on the pavement loading conditions and the constraints of the owner agency.

1. Determine the level of traffic forecasted in the next 20 years.

2. Understand the pavement section design or rehabilitation strategy.

In order to make the proper mixture selection, the designer must have knowledge of the proposed pavement construction or rehabilitation and intended pavement performance.

3. Determine the regional climate

conditions. Iowa's one-day low pavement temperature ranges approximately 5°C from north to south. Adjusted for 98% reliability, the values range from -29°C to -24°C. The seven-day high pavement temperature across the state varies by 3°C. Adjusted for 98 percent reliability, the pavement temperature values range from 56°C to 59°C. Climate details for a specific location can be obtained from the FHWA website, www.tfhrc.gov/pavement/ltp/bind/download.htm.

4. Compute the anticipated 20-year

pavement loading (ESAL20). The design pavement loading is measured in ESALs. To determine the design ESALs on the project, use the traffic conditions from step 1 and compute the ESAL20 using the methods outlined in Section 5D-1,G, of SUDAS's design manual.

5. Identify any special conditions that

impact the pavement. The standard selection process is based on high-speed traffic with a broad distribution of vehicle types. There are numerous special conditions, such as heavy trucks and seasonal traffic, that may require changes in the standard pavement materials/mixture selection.

6. Select the HMA mixture criteria

for each pavement layer. Using the information developed in steps 1 through 5, select the PG binder grade, mixture size, mix design level (ESAL20), and aggregate properties.

7. Check for availability of materials to

meet the mix design criteria. Review the mix design criteria selected in step 6 and determine if the binder and aggregates required to meet the mix design criteria are readily available or accessible at a reasonable cost.

8. Place mix criteria in the project plans and proposal.

Sample project plans

This section contains an example of what may be included in project plans, which are mentioned in step 8 of the design checklist.

Title page

The traffic and ESAL20 projections should be listed on the title sheet of the plans.

The ESAL20 value should coincide with the selected mix design level.

Typical section

Lift thickness should be shown on the typical section. The lift thickness should match or exceed the recommended lift thickness for the mixture size selected. The lift should be designated as surface, intermediate, or base.

Bid items

Unless otherwise specified, each bid item covers the mixture and binder grade selected. HMA mixture bid items follow the same general format used by the Iowa DOT, as shown in the following example:

HMA (1M ESAL) Surface, 3/8 in., PG 58 -28

For more information

To learn more about HMA pavement mixture selection and view more detailed instructions and charts, go to www.iowasudas.org/documents/5D-1-07.pdf for the PDF version of Section 5D-1, "HMA Pavement Mixture Selection," of the SUDAS Design Manual.

To view the online version of the entire SUDAS Design Manual, go to www.iowasudas.org/design.cfm.

Contact Larry Stevens, SUDAS Director, 515-294-0419, lstevens@iastate.edu. ■

Stanley L. Ring Memorial Library: New acquisitions

Note about delivery of materials: *The library now sends orders through the U.S. Postal Service. This change is resulting in important savings for LTAP, but ordered materials do not arrive as quickly. If you have an urgent need for library materials, let us know when you place your order and we will arrange faster delivery.*

Three ways to order LTAP library materials

- Use the online catalog, www.ctre.iastate.edu/library/search.cfm.
- Contact Jim Hogan, library coordinator, 515-294-9481, hoganj@iastate.edu, fax 515-294-0467.
- Mail or fax the order form on the back cover of *Technology News*.

Publications

P 1713 **Innovative Intersection Safety Improvement Strategies and Management Practices: A Domestic Scan**

This publication documents the findings of a domestic scan of innovative intersection safety processes, practices, and treatments in the states of Florida, Michigan, North Carolina, Oregon, and Texas that have been demonstrated to, or have the potential to, improve safety at intersections.

P 1714 **Making Intersections Safer: A Toolbox of Engineering Countermeasures to Reduce Red-Light Running**

The primary focus of this publication is to address engineering design and operational features that can discourage red-light running. The report discusses the background characteristics of the red-light running problem; identifies how various engineering measures can be implemented to address this problem; suggests a procedure for selecting the appropriate engineering measures; and provides guidance on when enforcement, including red-light cameras, may be appropriate.

P 1715 **Field Guide for Inspecting Signalized Intersections to Reduce Red-Light Running**

This guide is a companion document to the report *Making Intersections Safer: A Toolbox of Engineering Countermeasures to Reduce Red-Light Running*. It suggests a procedure for conducting an investigation of a specific

intersection that has been identified as a red-light running problem site to identify possible engineering deficiencies that could be contributing to violations and crashes, and to form initial opinions as to possible countermeasures.

P 1716 **Red Light Camera Systems: Operational Guidelines**

The purpose of these guidelines is to assist jurisdictions who are considering the implementation of red-light camera systems and help them avoid inconsistent or incorrect application of such systems. The guidelines address typical questions that have been raised regarding the contracting, design, implementation, and operation; legality and intent; and accuracy and reliability of the technology of photo enforcement systems.

P 1717 **Safety Evaluation of Red-Light Cameras**

This report presents the findings of a study to determine the effectiveness of red-light camera systems in reducing traffic crashes. The study estimated the crash and associated economic effects of such systems at seven jurisdictions across the country involving 132 treatment sites.

P 1718 **Toolbox on Intersection Safety and Design**

This report demonstrates practical design measures and tools that will help to improve intersection safety and operations for all users. It also provides examples of effective applications and discusses experiences with innovative solutions. It is expected that the report will help readers develop intersection designs, including roundabouts, that achieve the highest levels of safety, mobility and cost-effectiveness.

P 1720 **Traffic Sign Handbook for Local Roads**

This handbook provides guidance for solving many traffic problems encountered on two-lane local roads. It is a companion to the New York MUTCD.

P 1721 **Traffic Signs and Pavement Markings**

This workbook was prepared as part of a New York LTAP workshop. It covers various aspects of both signs and pavement markings.

P 1722 **Crash Patterns and Potential Engineering Countermeasures at Maryland Roundabouts**

This report looks at crash patterns of Maryland Roundabouts and suggests countermeasures which might improve operation and safety. ■

Conference calendar

July 2008

17–21	International Conference on Concrete Pavements-ISCP	San Francisco, CA	For details see www.concretepavements.org
22–23	Motor Grader Operator Training	Creston, IA	Georgia Parham 515-294-2267 gparham@iastate.edu

August 2008

14–15	Mid-Continent Transportation Research Forum	Madison, WI	Howard Rosen 608-262-4341 rosen@epd.engr.wisc.edu
26	Mower Safety Workshop	Davenport, IA	Tom McDonald 515-294-6384 tmcdonal@iastate.edu
26	Iowa Roundabout Conference	Ames, IA	Judy Thomas 515-294-1866 jathomas@iastate.edu
27	Iowa Roundabout Conference	Cedar Rapids, IA	Judy Thomas 515-294-1866 jathomas@iastate.edu
27	Mower Safety Workshop	Iowa City, IA	Tom McDonald 515-294-6384 tmcdonal@iastate.edu
28	Mower Safety Workshop	Eldora, IA	Tom McDonald 515-294-6384 tmcdonal@iastate.edu
29	Mower Safety Workshop	Waterloo, IA	Tom McDonald 515-294-6384 tmcdonal@iastate.edu

September 2008

10	Snow Rodeo (Truck, Motor Grader, Loader)	Newton, IA	Duane Smith 515-294-8817 desmith@iastate.edu
11	Iowa Maintenance Training Expo	Newton, IA	Duane Smith 515-294-8817 desmith@iastate.edu
30	ISRMSA Streets and Roads Workshop	Ames, IA	Duane Smith 515-294-8817 desmith@iastate.edu

October 2008

1–2	ISRMSA Streets and Roads Conference	Ames, IA	Duane Smith 515-294-8817 desmith@iastate.edu
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November 2008

20	Managing Stormwater Quality in Iowa: Infiltration Practices Focus	Ankeny, IA	Beth Richards 515-294-2869 brich@iastate.edu
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Upcoming Iowa Roundabouts Conference

Registration is now open for the Iowa Roundabout Conference, sponsored by the Iowa Department of Transportation. The same conference will be held at two locations and there is no charge for attendance. The first event is on Tuesday, August 26, 2008, at the Gateway Hotel and Conference Center in Ames, Iowa. The second event will be held on Wednesday, August 27, 2008 at the Marriott Hotel in Cedar Rapids, Iowa. Register online at www.ctr.iastate.edu/events/roundabout.

DOT representatives from Washington, Wisconsin, and Kansas will speak on the advantages of roundabouts. They will also speak on high-speed roadways and roundabouts, as well as experiences with planning, design and construction. The event will conclude with a panel discussion on roundabouts and the local system.

For more information contact Judy Thomas, Center for Transportation Research and Education, 515-294-1866, jathomas@iastate.edu. ■

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