

# Crossroads

Spring 1999



TRANSPORTATION Information Center — LTAP

University of Wisconsin—Madison

## SUPERPAVE benefits now available

Wisconsin DOT and the asphalt industry have made great strides in implementing SUPERPAVE technology in Wisconsin. It is now time for local agencies to begin evaluating it and to join hands with industry to take advantage of its benefits—longer lasting and better performing pavement.

SUPERPAVE came out of the Strategic Highway Research Program (SHRP), a multi-million-dollar research effort concluded in the early 1990s. Implementation of the research results has been under way for the last five years. One result is a better way to select asphalt and to design asphalt mixes.

Traditional asphalt mix design was often a compromise between a mix that, on the one hand, resisted rutting from heavy truck traffic, and on the other hand, resisted environmental degradation from oxidation and thermal cracking.

Other methods of selecting asphalt binders and designing pavement mixes were of limited help in managing this balance. SUPERPAVE technology offers a much more practical method for considering the traffic loads and environment. At the same time, the mix design procedure uses testing equipment that better simulates actual pavement construction and conditions.

### "Designer" asphalts for local conditions

"The most important advantage of SUPERPAVE is that it can consider specific local conditions," says Hussain Bahia, asphalt pavement specialist at the UW-Madison College of Engineering. "Using information on local temperature extremes from weather station data, you can evaluate asphalt products to find one that fits your specific conditions."

Asphalt products were previously tested at a standard temperature, but new lab testing equipment can test it at specific temperatures that represent local conditions. In addition SHRP research has developed the necessary criteria and reference tables. "It takes the guesswork out of mix design," Bahia says.



"Designer" pavements chosen using SUPERPAVE technology last longer and perform better.

These new testing and analysis systems now can be used to more accurately predict asphalt pavement performance. They can predict rutting, fatigue cracking, and low temperature thermal cracking in terms of pavement age, the amount of traffic, or the speed of the traffic.

"This is very important for cities and municipalities," says Bahia. "It lets us design a mix specifically for intersections, for example, where slow moving trucks tend to cause rutting. It also lets you know how much cracking you will have at what point in the pavement's life so you can predict when maintenance will be required."

"The SUPERPAVE projects I have seen have been very good so far," says Brian Pitlik, Vice President of Pitlik and

*continued on page 7*

## Inside

<b>Idea Exchange: Quick fix for hot mix repairs; Compaction crucial for pothole fixes</b> .....	2
<b>Training flaggers to be safe and effective</b> .....	3
<b>Testing your Flagging I.Q.</b> .....	3
<b>Asphalt pavement warranties successful</b> .....	4
<b>Setting speed limits on local roads</b> .....	6
<b>Using recovered materials in highways</b> .....	8

## Idea Exchange

### Quick fix for hot mix repairs

From Michigan comes a single truck system for small hot-mix road repairs. The key? A front-mounted steel drum roller that uses hydraulic down pressure for wedging and pothole patching.



Photo credit: Ed Hancock

"This works great," says Mike Roper, managing director of the Otsego County, Michigan, Road Commission. "It smooths off the repair so you don't have a bump."

The relatively inexpensive roller—under \$4500—mounts on the plow frame of a single-axle tandem truck. The 48-inch steel drum roller weighs 1100 pounds and exerts up to 2500 psi of pressure. It includes an integral roller wash and scraper system. Otsego County found the device so useful they bought a second one.

"We've got two patch trucks out all the time," Roper said. "It's a quick job to take it on and off. It's all self-contained with its own hydraulics. All it needs is power."

"I get so tired of seeing workers put a shovel full of hot mix in a pothole and walk away," said Norm Weber, sales representative of AIS Traverse City which sells the rollers. "They don't like to be standing out on the road too long. With the roller mounted on a truck, the truck provides protection. The hydraulic pressure and the weight of the truck make a nice smooth patch."

For more information about truck-mounted rollers, phone AIS at 800/320-1247. Story adapted from the April/June 1998 issue of *The Bridge*, newsletter of the Michigan LTAP center.

### Compaction crucial for pothole fixes



How often do you see crews toss some cold mix in a pothole, pat it with the shovel and drive off? No wonder that pothole is back—bigger than ever—in a week or two. Nothing is gained, and the crew's labor is wasted.

Pothole patches *can* last, research shows, and you don't need to square up the hole or use a vibratory compactor to make that happen. Repairs using the "throw and roll" method will last a year or longer if you use high quality material and **make sure to compact the patch**. The easiest way to compact is to drive over the patch two or three times with the trucks tires. Using separate compaction equipment will produce even better results.

Patching material should combine high quality crushed aggregate with few fines with emulsified asphalt binders having an anti-stripping additive. It need not be very expensive. The lowest cost material tested in the study, PennDOT 485, performed as well as proprietary mixes costing twice as much. And it can be easily produced in local hot mix plants.

The pothole study included 1250 pothole patches in 22 locations around the US. It was conducted by the SHRP research project of the Federal Highway Administration.

*Specs for PennDOT 485 patching material are available from the T.I.C. Call, write, fax or e-mail for a copy.*

### Crossroads

This newsletter provides information on roads and bridges to local officials and is published quarterly by the Wisconsin Transportation Information Center, part of the nationwide Local Technical Assistance Program (LTAP). **Crossroads** is produced with assistance from the Federal Highway Administration, the Wisconsin Department of Transportation, and the University of Wisconsin-Extension.

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Be sure to check your  
Flagging I.Q. on page 3.



## Training flaggers to be safe and effective

Flagging may be an entry-level job but your flagger is the most visible member of your maintenance or construction crew. The safety of the crew and of the passing drivers depends on the flagger doing a good job. Every flagger should be appropriately trained and properly equipped.

Training for trainers—with handbooks and a video— help you prepare to do the needed training. The T.I.C. is again offering its 1½-day Flagger Trainer course at four locations around the state. This course will give street, highway, construction, and utility supervisors, and safety trainers the tools to properly train their own employees to be effective work zone flaggers.

Course participants will participate in the half-day flagger training course and then learn how to use the instructor's kit to make their own training sessions interesting and effective. Participants receive the *Flagger Training Instructors Guide*, a professional-quality training video, and 20 copies of the *Flaggers Handbook*. For agencies too small to have their own flagger trainer, the T.I.C. will offer the half-day flagger course around the state in May and June.



*Every flagger should be appropriately trained and properly equipped.*

### Test your Flagging I.Q. — *What's wrong with these pictures?*



**1 No equipment.** A flagger should always use the proper equipment. At a minimum, a STOP/SLOW paddle and a safety vest, shirt or coat of approved color are required. Approved colors are orange, yellow, strong yellow-green, and fluorescent versions of these colors. Too often flaggers use an 18" x 18" orange flag instead of the required STOP/SLOW paddle. In emergency situations only, a red-orange 24" x 24" flag can be used, but must be replaced with a STOP/SLOW paddle as soon as one is available. The 18" x 18" orange flag is not permitted for flagging.

**2 Not on shoulder.** A flagger should stand on the shoulder. Sometimes a flagger has to walk into the road to be more visible to approaching cars. If this is necessary, the flagger should only enter the road after one or more cars are stopped. The flagger should always return to the shoulder before releasing traffic.

**3 No escape route.** A flagger should stand so there is always a free escape route. Too often a flagger stands next to a parked car or other obstruction that blocks a safe and quick get-away.

**4 In shade and not on shoulder.** A flagger should stand where he/she is visible to approaching traffic. This usually means in the sun, not the shade. Consequently, a flagger needs to have a hat, sun glasses, water, and sun screen for protection from the sun.

**5 Crouching.** A flagger should stand. Flaggers who crouch or sit down increase the time it takes to make a safe escape and are less visible to approaching traffic.

## Asphalt pavement warranties successful

Warranties, long available on products from toasters to Toyotas, are cautiously being offered on hot mix asphalt pavement projects in Wisconsin. Contractors have built nearly 50 road miles of warranted projects on state highways since 1995 and the state is very pleased with them.

"We're pretty excited about it," says John Volker, Chief Product Quality Management Manager for WisDOT. "We're always looking out for the taxpayer, and we think we're getting our money's worth out of it."

The warranted pavements are performing better than typical pavements and cost less per ton than standard projects, according to an October 1998 WisDOT Progress Report on Asphaltic Pavement Warranties.

For warranty projects the owner specifies the final product in terms of condition and performance, such as the amount of alligator or block cracking permitted per 1/10th mile segment. Then it is up to the contractor to decide how to construct the pavement. This gives contractors freedom to try new techniques.

"They do a better job of constructing in general," says Volker, "and we're seeing a lot of innovative concepts on these projects."

"I think a warranty promotes higher quality hot mix asphalt," agrees Brian Pitlik, VP of Pitlik and Wick paving contractors, Eagle River. "And all parties bidding on a warranty project are bidding on a higher level of quality."

Another potential benefit of warranty projects is that the municipality knows it will be free of maintenance responsibility for the life of the warranty. In addition, future maintenance costs should be less because of the higher quality construction.

### Base, subgrade quality critical

Currently, warranties are only available on the hot mix portion of asphalt paving projects. Native soils are extremely variable, so contractors and WisDOT have been very careful to choose sites with stable, well-drained soils for their warranty projects.

"We don't have control over the base course or the subgrade," emphasizes Jerry Waelti, Executive Director of the Wisconsin Asphalt Pavers Association (WAPA). "If they are adequate, we can do a warranty project."

Currently there are no unified and verifiable criteria for quality subgrade and base course preparation. Differences



Warranty asphalt construction has many benefits.

of opinion as to what would support the new base and asphalt "caused many arguments" and created "very stressful project situations," according to the WisDOT's Progress Report. The Department's pavement design program is working on establishing functional and effective specifications for bases and subgrades.

### Contract elements

Sample specifications are available for laying warranted asphaltic pavements over flexible bases and over concrete pavements. They give

the contractor responsibility for selecting the mix formula and all materials, and for developing a quality control plan. Contract bonds and five year warranty bonds are required. They also set up a conflict resolution team as the final authority if a conflict occurs.

Establishing warranty criteria is a critical element. Criteria are described in terms of common types of pavement distress: edge raveling, flushing, longitudinal cracking, rutting, pot-holes, etc. A threshold level and remedial action is defined for each type. For example: *Flushing, 20% of the segment length, remove and replace distressed surface mixture full depth.* Methods and timing for surface distress surveys are included, as are traffic control requirements and payment terms.



Soils are variable and subgrade preparation is very important.

"You have to set parameters," says WAPA's Waelti, "and they have to be do-able. You can't go in with the idea that there will be no cracks; it's not economical for most roads." The state's extensive pavement management system helped in setting their parameters. The database accurately reflects what a five-year-old pavement should look like. In addition, pavement surface condition must be carefully inspected every year.

continued on page 5

## Getting started

Local officials should start at the project's earliest design stage. Ask your consulting engineer if the project, or a segment of it, might be a suitable candidate for a warranty pavement. It is important to have good pavement history records and accurate subgrade information.

Review warranty specifications and modify them to meet your needs and expectations. Copies are available from John Volker at the WisDOT Bureau of Highway Construction. Warranty construction, which was experimental, is now a standard process and approved by FHWA for federal highways.

Consult your asphalt paving contractor and industry representatives to see if warranty work is feasible in your area. "Many contractors like it because they can control the quality 'right now,'" says Jerry Waelti. "The workers take pride because they know that everything is hinging on their work. Contractors are willing to do warranty work because they know their product and they know it will stand up."

"I think it's a good idea," says paving contractor Brian Pitlik. "It's a good tool for people to use in the right conditions, and it helps us deliver the project more smoothly."

*For copies of warranty specifications contact John Volker, WisDOT Bureau of Highway Construction, 608/246/7930.*

## Calendar

### T.I.C. workshops

*Specific details and locations for workshops are in the announcements mailed to all Crossroads recipients. For additional copies, or more information, call the T.I.C. at 800/442-4615.*

**Flagger Instructor Training** A 1½ day training course for road supervisors and safety trainers who supervise or train flaggers for construction and maintenance operations. Participants will get the training and tools they need to properly train their own employees to be effective work zone flaggers. Participants will receive an instructor's training kit that includes the *Flagger Training Instructors Guide*, a professional quality *Flagger Training* video, and 20 copies of the *Flaggers Handbook*.

April 13-14	Wausau
April 15-16	Brookfield
April 19-20	Eau Claire
April 21-22	Cable

**Flagger Training.** This half-day workshop is for agencies that do not have their own flagger training instructors. It will be taught in various locations during May and June. Look for a brochure or call T.I.C. at 800-442-4615 if you would like to schedule a session at your location.

**Roadway Maintenance.** This workshop is your opportunity to improve your street and road maintenance operations. It will include preventive maintenance techniques and investigating and repairing pavement failures.

March 10	Green Bay	March 16	Cable
March 11	Brookfield	March 17	Eau Claire
March 12	Barneveld	March 18	Tomah
March 15	Rhineland		

**Liability for Local Road Agencies.** Learn your responsibilities for managing local road liability and ways to limit liability. The topics included are local government immunity, negligence, snow and ice removal, and traffic control. This is part of series on Local Transportation Issues.

If you haven't received a brochure for the series call your local county Extension office or (608) 262-9960.

Mar 4 10:00 to 11:50 an ETN location in every county

### REPEAT

**Basic Work Zone Safety.** This workshop was conducted 10 times during January, but due to

demand it will be scheduled again in several locations around the state in early spring. It is for road supervisors and maintenance personnel who plan and set up work zones. It covers temporary traffic control devices, the parts of a work zone, how to set up a work zone, mobile operations, and pedestrian, worker, and flagger safety. Participants will receive the new pocket-size booklet *Workzone Safety: Guidelines for Construction, Maintenance and Utility Operations*. If you couldn't attend in January and want to in March, look for a brochure in the mail or call the T.I.C. at 800/442-4615 to get on the mailing list for a brochure.

### UW-Madison Seminars

*Local government officials are eligible for a limited number of scholarships for the following engineering courses in Madison. For details, use the form on page 7, call 800/442-4615, or e-mail: ranum@engr.wisc.edu.*

#### Fleet Maintenance Management

April 19-21

#### Managing Street and Highway Design Projects

April 19-20

#### Environmental Impacts of Highway Projects

April 26-28

#### Mastering the Budget Process in Public Works

May 10-12

#### Highway Drainage Design

May 10-11

#### Pavement Design

May 12-13

#### Planning and Financing Stormwater Management Programs

May 17-19

#### Municipal Engineering Fundamentals for Non-Engineers

June 7-9

#### Traffic Signal Design and Operations

July 12-14

### Other Training Opportunities

1999 North American Snow Conference, April 18-21 in Duluth, MN. Contact the American Public Works Association at 816/472-6100 for conference information.

## Setting speed limits on local roads

Across the country, speeding is a major concern—with good reason. Seventy percent of drivers exceed posted speed limits, most by 10 mph or more, according to one study. And, as speeds go up, crash severity and injury risk increase—by 5% for each one mph, another study suggests.

Setting speed limits can be a challenge for local officials. They must balance a variety of competing, and often vocal, concerns from drivers, residents, fire departments, law enforcement agencies, and traffic engineers. To be legal and enforceable, speed limits must be properly set following state statutes and adopted by local ordinance. A new fact sheet from the T.I.C. will help.



**Setting Speed Limits on Local Roads, No. 21**, explains the philosophy, summarizes statutory limits, and describes the process for changing limits. It also discusses signs, enforcement, advisory speeds, and other speed issues.

The state has set speed limits for all roads. However, municipalities can change them under authority and guidelines in the *Wisconsin Statutes*. For example, the statutory limit is

25 mph on residential streets within a village or city. Local authorities responsible for the roadway can raise or lower that limit by as much as 10 mph.

Common sense says that regulating speed is a good way to make streets and highways safer. As a result, citizens may demand lower speeds, especially after a severe crash or pedestrian injury.

Driving behavior is difficult to manage, however. Most drivers choose a speed that feels safe and comfortable to them with little attention to posted limits. Many other things influence what speed they choose:

- road geometry
- land use
- traffic volume and prevailing speed
- weather and road conditions
- presence of pedestrians, bicyclists and parked cars
- their own attitudes, habits and capabilities
- their vehicle's type and characteristics
- enforcement and public attitudes

Before setting limits on a road section, you must do engineering and traffic speed studies, according to the statutes. You may find county Traffic Safety Commissions and district WisDOT engineering staff helpful. It is particularly important to coordinate limit setting and enforcement with your local law enforcement agency.

In general, speeds should be consistent, safe, reasonable and enforceable so as to encourage voluntary compliance. When limits are unreasonably low drivers disregard them and learn disrespect for all limits. At the same time low limits may give pedestrians and residents a false sense of security. On the other hand, unreasonably high limits create unnecessary risks.

When limits are set so that 85% of drivers voluntarily comply, it is then possible and reasonable to enforce them with the 15% who drive too fast.

*Single copies of **Setting Speed Limits on Local Roads, No. 21**, are available from the T.I.C. Call, e-mail, fax, or write us for yours. Please use the form on page 7.*

## Resources

*Materials are available from the Wisconsin T.I.C. unless otherwise noted. For a copy call 800/442-4615 or use the form on pg. 7.*

**Using Recovered Materials in Highway Construction** (No. 20), T.I.C. factsheet, 8 pp. **New in 1999**, this pamphlet introduces the benefits, sources, applications, and environmental considerations of using reclaimed materials in highway construction. Glass, fly ash, bottom ash, boiler slag, foundry sand, and steel slag are all discussed.

**Setting Speed Limits on Local Roads** (No. 21), T.I.C. factsheet, 6 pp. **New in 1999**, this pamphlet gives background information, summarizes statutory limits, and describes the process for changing speed limits. It also discusses signs, enforcement, advisory speeds, and other speed issues.

**Five Traffic Information Program Tips from Florida**, Florida Section of ITE, 1998. Here are one-page answers to five tough traffic questions often asked by neighborhood groups:

1. Won't a STOP sign slow traffic on our street?
2. Why are those STOP signs so high?
3. Why can't we have a 4-way STOP sign?
4. Won't a traffic signal reduce accidents at our intersection?
5. How much traffic will that new development generate?

### New videotapes in the T.I.C. library

*Tapes are loaned free through Wisconsin County Extension Offices. If you need a video catalogue, call 800/442-4615.*

**Stormwater Best Management Practices at Quarry Sites** #18182, Wisconsin Aggregate Producers, Wisconsin Asphalt Pavement Association, Wisconsin Road Builders, and Wisconsin Dept. of Natural Resources, 5 min. Covers measures recommended to protect water quality at a quarry site. Includes stormwater, aggregate wash water, etc. Useful for quarry operators, owners, and the public.

**Modern Aggregate and Hot Mix Asphalt, Production Quarry Version** #18183, Wisconsin Asphalt Pavement Association, 8 min. Reviews steps in hot mix asphalt production and paving. Includes quarry blasting, aggregate production, control house, drum mixer, bag house, storage silo, and paving. Good overview for the public and elected officials.

**"So You Have to Run a Stack Test," Air Emissions Testing** #18184, Wisconsin Aggregate Producers, Wisconsin Asphalt Pavement Association, Wisconsin Road Builders, and Wisconsin Dept. of Natural Resources, 5 min. Overview of air quality testing procedures. Covers aggregate and hot mix asphalt plants. Helpful for plant owners, elected officials and the public.

**Modern Aggregate and Hot Mix Asphalt, Production Gravel Version** #18185, Wisconsin Asphalt Pavement Association, 9 min. Same as "Quarry Version" (above).

**SUPERPAVE benefits** *from page 1*



*Wisconsin's asphalt pavers and the asphalt industry have invested in the sophisticated new testing equipment SUPERPAVE requires.*

Wick paving contractors in Eagle River. "It's good because it requires you to pay attention to the fine aggregate angularity, and because the level of mix design corresponds to traffic counts," he says. He also appreciates having more levels in the MV classification than before.

The new technology required drastic changes in laboratory analysis and testing. Fortunately the asphalt industry, Wisconsin's paving industry, and WisDOT

have converted to this system and can do the required tests.

Local agencies can now begin asking for these products because the industry can deliver.

**How to try SUPERPAVE**

The first step is easy. Specify the asphalt binder using Performance Graded (PG) specifications. WisDOT has selected one grade for its projects. Local highway and street agencies will want to select others that better reflect regional differences – softer asphalt for up north, for example. The AASHTO MP1 table gives guidance on selecting the right PG asphalt.

"Refineries understand the system," says Hussain Bahia. "You can be specific in requiring asphalt that is performance graded for your conditions."

The next step is to use SUPERPAVE mix design to specify aggregate gradation, asphalt content, voids, etc. WisDOT now has considerable experience with SUPERPAVE mix designs for high volume (HV) roadways. Local agencies will need to work with their suppliers to identify similarly

successful MV and LV mixes appropriate for county and local roads.

One approach is to have commonly used mixes evaluated by the SUPERPAVE system for the area's temperatures and the project's traffic volumes. Alternatively, a mix design specialist can suggest a mix based on those data.

"Customers need to do their homework first so they're not surprised," says Pitlik. "They need to select a job, research, talk to the contractor, get a budget estimate and then try one."

Costs to use SUPERPAVE technology are comparable to those for existing processes, according to Bahia. Some contractors who tried SUPERPAVE designs found that the mixtures they produced cost less, while others indicated there was an increase in design and testing costs. Testing costs are in the range of \$2000-\$3000 for a typical 100,000 ton asphalt paving project.

The benefits are substantial. Pavements designed specifically for the environment and conditions will result in longer pavement life and fewer construction and maintenance delays for the traveling public. The Federal Highway Administration estimates that \$40 billion is wasted every year because of delays related to highway maintenance.

Now that Wisconsin's progressive asphalt industry can effectively supply these better performing pavements, the next move is up to local agencies. They must be willing to become more knowledgeable customers and know how to ask for these quality products.

*For help in selecting performance graded asphalts and SUPERPAVE mix designs, contact your asphalt paving contractor and consulting engineer. You can also contact the Asphalt Research Program of UW-Madison at 608/262-8949. WisDOT has a State Standard Specification for Performance Graded Asphalts which you can review or reference in your bid specs. Copies of the AASHTO performance graded asphalt chart are available from the T.I.C. Call, fax, e-mail or write (see form below).*

## Reader Response

If you have a comment on a **Crossroads** story, a question about roadways or equipment, an item for the *Idea Exchange*, a request for workshop information or resources, or a name for our mailing list, fill in this form and mail *in an envelope* to:

**Crossroads**  
Transportation Information Center  
University of Wisconsin-Madison  
432 North Lake Street  
Madison, WI 53706

**Or call, fax, or e-mail us:**

phone 800/442-4615  
fax 608/263-3160  
e-mail Ranum@engr.wisc.edu

- Please put me on your **Crossroads** mailing list.
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*(We'll contact you to get more details or answer your question.)*

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# Using recovered materials in highways

Waste materials generated by industry and consumers can be useful in building highways, filling embankments, and back-filling trenches. Using recovered materials this way helps dispose of them constructively and avoids filling up expensive landfill space. Often they can replace expensive, and sometimes scarce, virgin materials.



Waste glass is one reclaimed material that has many uses, such as trench backfill and base course material.

with the state Department of Natural Resources. As a result, they can normally be used with no additional permits or certification from DNR.

Glass of mixed colors can't be recycled into new glass and is a prime candidate for construction use. It is locally available from recycling centers around the state. Crushed to a maximum size of about 1/4 inch, it can be used by itself as a backfill material

Recycled glass, bottom ash, foundry sand, and steel slag have all been used successfully in state and local projects. All are easily crushed and blended using conventional aggregate processing equipment.

A new fact sheet, **Using Recovered Materials in Highway Construction, No. 20**, and a videotape on using recovered materials, are now available, produced by the T.I.C. in cooperation with the Wisconsin Recycling Market Development Board. They discuss how to use the four most common recovered materials and identify more than two dozen successful application sites around the state.

Base course and embankment fill are among the most common uses. Producers classify their waste materials into standard industrial byproduct categories and certify them

or blended with natural aggregate. Standard specifications for using glass and other reclaimed materials are available from the Wisconsin Department of Transportation.

Wisconsin is a leader in evaluating and using recycled materials in highway construction. WisDOT has done considerable testing and evaluation and numerous demonstration projects. The Recycling Market Development Board has worked with recycling facilities to identify, test and classify suitable materials.

Contact the T.I.C. for copies of **Using Recovered Materials in Highway Construction, Bulletin No. 20**. Contact the Recycling Market Development Board at 800/435-7287 for information on materials availability. Your WisDOT district office materials section can help with specifications or advice on appropriate use.

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