CIRCUIT RIDER CASE STUDY

Local cooperation achieves needed road makeover

A stretch of bad road in the Town of Auburn got a much-needed makeover last fall thanks to local leadership, cost sharing and input from Safety Circuit Rider Jack Gerlach. Chippewa County Highway Commissioner Bruce Stelzner put Gerlach in touch with Town Chair Leo Zeman in April 2008. Zeman asked Gerlach to survey two sites that posed safety problems and help the Town explore low-cost solutions. One location was a short but hazardous section of road with a compound curve at the top of a hill with poor visibility. This situation and its outcome are a good case study of how Safety Circuit Riders work with local governments to resolve specific road safety issues swiftly and cost effectively.

Advancing a solution

Gerlach learned the 720-foot length of winding pavement had been a concern for more than 10 years. It was the scene of a collision with multiple fatalities in 1996 and numerous run-offs due to the blind curve. The road section also straddles the border between Auburn and the Town of Dover in Barren County. Advancing a solution meant getting the cooperation of both towns, both counties and at least two landowners whose properties abut the right of way.

Assessing the road itself, Gerlach identified grades of 7 to 10 percent in both directions with an offset centerline of 15 to 20 feet at the top of the hill that created a double curve of less than 150 feet. As Zeman recalls, “When you got to the top, you’d expect to go one way and you’d go another.”

Besides poor visibility, Gerlach noted erosion on the face of the hill. The back slope to the north rose about 20 feet from the edge of the shoulder. “It helped that I could examine the site with a

Continues on page 8
Fresh take on pothole patching and prevention

**WHEN WINTER MELTS** into spring, it leaves behind rough roads and needed repairs. This year is no exception as local highway and public works departments face another bumper crop of potholes.

The pothole-patching season raises a few questions. What is it about severe cold and snow that produces potholes? What basic fixes do local “patching patrols” follow and what newer options are they using for long-lasting repairs—especially in tight-budget times? Finally, what does it take to keep potholes from forming in the first place?

**Pothole pathology**

Motorists tend to label any pavement distress as a pothole when, in fact, a genuine pothole is a bowl-shaped hole of broken pavement caused by fatigue at and beneath the surface. Inadequate pavement structure often is behind chronic pothole problems. Low-quality materials, poor compaction, water-saturated underlying soils or inadequate pavement thickness can result in substandard pavement easily affected by conditions.

Good road or bad, severe winter weather and the spring thaw push pavements to their limits. Drainage, moisture seeping through fatigue cracks, freeze-thaw cycles and damage from loaded trucks all accelerate pothole formation. The harsher the winter, the heavier the snowfall, the more cycles a road endures.

The life cycle of asphalt pavement materials also plays a part. As asphalt ages, it becomes brittle. Cracks form more readily from the combined forces of traffic, nature and maintenance. Now less flexible, the pavement allows moisture to permeate its surface and speed deterioration.

In the freeze-thaw cycle, water in the pavement structure expands as it freezes and, as temperatures fluctuate, the water thaws and freezes again. Through repeated cycles, the pavement heaves and cracks. Many winter maintenance activities, such as sanding and salting operations that keep roads open during and after storms, contribute more stress to this sequence of events.

**Distinguish one hole from another**

The classic pothole carries through all pavement layers, from the pavement surface to the sub-base and soil. It can grow to several feet wide and several inches deep. Other distresses that resemble potholes occur when there is delamination (also called debonding) of the top pavement layer(s) due to a poor bond between layers. When localized, this condition produces a pothole-like hole, but it penetrates only as deep as the layer where pavement lifts did not bond. Inadequate sweeping and cleaning of the surface before overlay, an inadequate tack coat, moisture on the pavement at the time of paving or poor compaction in the surface layer also causes delamination.

A fresh look at typical fixes for potholes demonstrates the options available to local road maintenance operations and how to make those fixes last.

**Timely crack sealing and other surface treatments early in the life of a pavement help prevent moisture from seeping beneath the surface and undermining pavement strength.**

**Better performance from temporary patches**

Many potholes require an immediate fix to make the roadways safe to drive and prevent vehicle damage. Temporary patching is the general rule when repairs are necessary in cold and snowy weather or during spring melt-off and rain. Highway departments often use a cold-patch asphalt mixture for temporary fixes because hot-mix asphalt is not available in the winter season.

Even if the patch is temporary, it pays to follow patching procedures designed to get as much life as possible out of the patch. Patches made using the “throw and go” method do not perform well. Where road crews place loose cold mix in an unprepared pothole and rely on vehicle traffic to compact the material, they can measure patch life expectancy in hours or days rather than months or years.

Studies show the performance of a temporary patch improves significantly with a “throw and roll” approach. Throw and roll calls for placing cold-mix material in a hole (even one filled with water and debris) and compacting the patch by four to eight passes of the road crew’s truck tires. If the center of the patch remains depressed after compacting, the crew adds more patching material and re-rolls it so the patch is...
slightly crowned from center to edge; traffic then supplies added compaction. Removing water and loose debris from the hole before patching is a simple added step that further increases patch life.

Effective semi-permanent patching

A semi-permanent patch is a more complicated method for repairing potholes on roads or streets. This approach is similar to a full-depth hot-mix asphalt patch except it uses cold-mix material. When installing this kind of patch, maintenance crews generally:
– remove water and loose material from the pothole
– cut pothole sides so they are vertical and square with sound pavement on all sides
– place the patching material, using a lift if the asphalt is more than three-inches deep
– compact the patch with a vibratory plate compactor or roller.

Another patching choice that produces a long-lasting fix in adverse conditions is spray injection patching. This involves a specialized truck- or trailer-mounted system that includes an emulsion tank, aggregate hopper and air compressor. The process first uses compressed air to blow water and debris out of the pot-hole. Then operators spray an asphalt emulsion mixed with aggregate into the pothole in layers, placing a layer of aggregate on top of the patch to keep the material from tracking under traffic. In practice, this process produces “temporary patches” that last three to five years.

A good cold patch

As with road construction, good materials contribute to performance of the patch or surface treatment. Since most pothole repairs depend on cold-patch materials, what is the basis for a good cold patch?
– workable in low temperatures
– stays workable in a stockpile over a period of several months
– stable under traffic, does not shove or rut
– sticks in wet potholes without tack coat
– remains on the aggregate, does not “strip” from the action of water
– compatible with hot-mix asphalt when paved over at a later time

Experts recommend using clean crushed aggregate with less than 2 percent fines (passing through a No. 200 sieve) and a maximum size of three-eighths to half-an-inch for a successful cold-mix material. Use anti-stripping additives and polymer-modified asphalt to improve performance further. Some proprietary cold-patch products have proven effective, but a non-proprietary mix using the right materials also works well.

Preventing potholes an ongoing effort

Pavements deteriorate at different rates for many environmental and structural reasons. Close attention and regular inspections serve as a check on potential pothole problems. It gives officials responsible for local roads the data they need to take appropriate preventive measures. Timely crack sealing and other surface treatments early in the life of a pavement help prevent moisture from seeping beneath the surface and undermining pavement strength.

Potholes happen. Local officials need effective patching methods in their arsenal to restore winter-weathered roads. But an ongoing effort to maintain good roads in good condition goes a long way to minimizing the impact of pothole season.

How a pothole forms

Spray injection patching works well under adverse conditions and produces long-lasting temporary patches.

Small cracks form on the underside of the asphalt first then on the surface where rain and melted snow seep in. The moisture expands when it freezes, creating deeper, wider cracks.

Vehicle weight causes pavement to bend slightly.

Multiple freeze/thaw cycles and constant vehicle loading cause cracks to penetrate the pavement, letting moisture seep below the surface. As this moisture expands with freezing, it pushes the pavement up and weakens it further. After melting, the ice leaves a cavity.

Vehicle traffic eventually compresses the weakened pavement over the cavity and the crack becomes a pothole.

Adapted from Minnesota Local Road Research Board video.
When large loads travel local roads: tips for managing big projects

Dodge County Highway Commissioner Brian Field understands this challenge firsthand. He explains how officials in the southeastern Wisconsin county handled an onslaught of large projects last year requiring permits to move lots of oversized and overweight loads. Two wind farm developments and a major natural gas pipeline construction project, all happening in close succession, prompted them to develop a better way to process requests.

With the future potential for other energy-related projects on tracts of open land, local officials throughout the state can learn from the proactive approach Dodge County adopted, after a rocky start, for managing the safe transport of large loads along its roads. Towns affected by the project did their own permitting but generally followed the county's lead.

First project overwhelms the system

Once the initial wind farm project began, Field says the county realized the implications of having so many oversized and heavy loads traveling on its roads. Contractors and trucking firms from all over the country inundated East Side Patrol Superintendent Chuck Bernhard, the county contact for the project, almost daily with individual requests for what amounted to hundreds of permits.

The project had 48 tower sites in Dodge County (another 18 in neighboring Fond du Lac County) that needed access permits and authorization for six or seven oversized/overweight loads coming into each site. They also requested multiple utility permits. Demand soon threatened to overwhelm the system.

"It took a while to develop a better way to handle permitting on such a scale without sacrificing normal operations," notes Field. It was "learn as you go," but it prepared local officials to rethink how to handle the projects that followed.

Regroup around new approach

After struggling to manage the chaos of permit requests and inspections on that first big project, Dodge County regrouped. Local officials put together a plan that simplified communication and successfully streamlined the process. Field describes their step-by-step approach as one that primarily protects local interests, but also helps project owners meet their objectives. The steps Dodge County follows now on all large permitting projects are outlined on the next page.
Public interest meets innovation

A range of large-scale permitting projects—logging operations, industrial agriculture, traditional power plants—regularly place demands on roads and local resources. Now a growing interest in alternative energy sources presents a fresh challenge to local officials. Field says the companies building wind farms in Dodge County work all over the United States on similar projects. He was not surprised to learn that every county they go to manages the permitting/damage assessment process differently. The companies encouraged Dodge County’s effort to take a uniform approach. Finally, Field notes that while the county supports such innovative projects that represent a new approach to producing energy and protecting the environment, he says their commitment to protecting the public interest comes first. Establishing an effective working relationship between local officials and the decision makers on large-load projects was an important step in doing so.

Dodge County’s step-by-step approach on large permitting projects

1 – Schedule early planning session
All groups with a stake in the outcome of the second wind farm project and the pipeline project assembled for early planning sessions. Before the trucks started to roll, Field and Bernhard called a meeting of individuals representing the general contractor, the utility coordinator, the trucking coordinator, the Wisconsin Department of Transportation and law enforcement officials. Together, they reviewed all aspects of the project and came up with strategies for minimizing disruptions and damage, and keeping things on schedule.

2 – Identify local concerns
Dodge County officials outlined their own issues of concern at the meeting, like public safety and establishing the condition of roads before, during and after the project. They explored a workable approach to damage assessments, restoration and cost recovery, and reviewed liability coverage limits and certificates of insurance requirements. The county also distributed its policies covering construction access and utility accommodation.

3 – Establish single point of contact
Insisting the general contractor name a key contact person was the change with the biggest positive impact on the process. Field says that having a single point of contact authorized to manage routes, update schedules and make damage assessments improved communication on the project tenfold. If there were problems, Bernhard knew whom to call to get action.

4 – Designate all staging areas and routes
Representatives on both sides surveyed project needs to designate best transportation routes and staging areas. For example, they reviewed how the contractor planned to prepare the route for huge cranes to cross county or town roads between tower sites. Bernhard says this involved putting down steel plates, a layer of stones and then wooden beams to carry the load and protect the roadbed. The county made a videotape record of the routes to log pre-existing conditions before the project commenced. They inspected every route with the project contact to identify hazards, obstacles or other concerns, and determined who was responsible for addressing each one.

5 – Issue permits for all access points
Part of simplifying the process, the county worked with the project contact to identify permanent and temporary driveway entrances, and issued permits in compliance with access policy.

6 – Issue blanket permit for oversized and overweight loads
Aware of the permitting demands of a project that needs to move hundreds of large loads over many months, the county arranged to issue a blanket oversized and overweight permit to the general contractor and trucking firms. They billed the project monthly for related costs, including inspections, traffic sign removal and replacement, intersection modifications, right-of-way restoration and pavement repairs. They required the project managers to keep a daily log of the oversized/overweight loads, recording the route, the date and time, and the hauler.

7 – Conduct daily inspections
Bernhard, or someone he designated, inspected all routes used for the project every day to assess any new damage and determine responsibility. Gathering this information in a timely manner meant less confusion later over who pays for damages.

8 – Inspect all routes after project completion
The county’s orderly approach to managing large-scale projects was in place by completion of the first wind farm. Bernhard retraced the construction truck routes to record the post-project condition of pavements, shoulders, ditches and access points. He used a previously shot video log for comparison. The process worked. Field says the contractor met with the county to review findings from this final inspection and paid off minor damages right away. Where it appeared stress from the loads and the volume of truck traffic shortened the expected life cycle of a pavement, the county developed a formula for compensation to offset future costs of resurfacing and billed the contractor.

Having a single point of contact to manage routes, update schedules and make damage assessments improved communication on the project tenfold.

Contact
Brian Field
Dodge County Highway Commission
920-386-3653
bfield@co.dodge.wi.us

Resources
Link to facts and figures on Wisconsin permitting guidelines.
Recovery Act dollars move into local road and bridge projects

**WISCONSIN’S SHARE** of transportation funding from the American Recovery and Reinvestment Act (ARRA) will start to flow into improvement projects as soon as this spring. The state received a total allocation of $529 million for state and local road, bridge and transportation enhancement projects. The State Legislature and Governor Jim Doyle committed an initial $300 million for “shovel ready” highway and bridge projects around the state.

Another $158 million is available for local projects. Of that amount, $48 million is earmarked for three urbanized Transportation Management Areas (Milwaukee, Madison, Kenosha area) and approximately $109 million is available for use on local projects statewide.

**Website an up-to-date resource**

The WisDOT website is a central source for current information on the Recovery Act program. Local officials can find pertinent content under Programs for Local Government where department officials plan to post frequent updates with program details and contact information. Regional Planning Commissions are another resource for local officials with questions.

Another source with facts and background on the state’s allocation of federal stimulus dollars is the new Wisconsin Office of Recovery and Reinvestment site.

**SPEED LIMITS** are set by state statute in Wisconsin, but state and local governments do have administrative power to modify speed limits on specific roadways under their jurisdiction. Knowledge of changing road conditions and traffic patterns help influence decisions about what limits are both safe and appropriate. The Wisconsin Department of Transportation has authority to modify speed limits on state trunk highways and it holds authority over some speed limit modifications proposed for local roads.

Speed is a significant factor in the severity of crashes. In 2007, Wisconsin counted 251 deaths and 10,984 injuries as a result of speed-related crashes. Speed accounted for 35 percent of all fatal crashes. It also is the major factor in the injury and death of pedestrians and bicyclists.

Studies show that drivers tend to drive at a speed they feel is comfortable and safe, regardless of the posted speed. That means posted limits rarely determine actual travel speeds unless enforcement is present. Several research studies modified existing speeds to a lower limit and found the change did little to reduce actual travel speeds. In some cases, the lower speed made a road less safe.

Another finding from these and other studies is that the difference in speeds between vehicles on a roadway has a major negative impact on safety. Called the speed differential, it shows that the greater the difference in speeds between vehicles, the greater the chance of a severe crash that results in injuries and significant property damage.

Researchers know driver behavior in response to road conditions determines actual travel speed. So traffic engineers developed a study method that considers prevailing speeds along with other details like site distance, traffic volume, conflicts, road geometry and enforcement to define a “rational” speed limit.
Summit planned on speed management guidelines

**THE WISCONSIN** Department of Transportation will introduce speed management guidelines in 2009 that promote a uniform approach to setting and changing speed limits on local and state roads. The guideline authors plan a statewide Speed Management Summit in mid-April to gather feedback on the proposed guidelines from local officials and others responsible for managing speed limit issues in Wisconsin.

WisDOT State Traffic Safety Engineer and Guidelines Project Manager Rebecca Yao says the initiative responds in part to provisions in Wisconsin’s 2006-2008 Strategic Highway Safety Plan addressing road safety issues throughout the state.

“We looked for efforts at safety-improvement that would have a real impact in Wisconsin,” Yao explains. “Exploring and implementing effective strategies to reduce speed-related crashes meets the criteria.”

The fact Wisconsin does not have a single document outlining an orderly process for managing speed limits persuaded Yao, working with Derek Hungness, Project Manager and Transportation Planner with SRF Consulting Group, to launch the speed management guidelines project.

Yao says the department frequently fields calls from local agencies asking how to conduct a speed study and what factors to measure when considering a change. “It was time to create something consistent and complete to offer as a resource.”

**Setting rational speed zones**

Researching the guidelines, Yao and Hungness surveyed a group of local officials last year to learn how counties, cities and towns in Wisconsin handle speed management. Some officials collect speed data, some do not. And constituent complaints often overrule clear evidence for setting rational roadway speeds, like how officials expect a section of road to function in the road system, crash record, road geometry or traffic volume.

Hungness says they recognize that local officials look to WisDOT for guidance on policies to sell back home. “On the topic of speed limits, the conversation goes quickly from engineering to a range of local issues that end up influencing the decision—for better or worse,” he notes. “Our goal with these guidelines was to offer a step-by-step process for establishing rational speed zones.”

The group also studied efforts in other states for ideas that applied in Wisconsin. Based on their findings, Yao says WisDOT agreed it made sense to develop a comprehensive overview of speed management that captures all useful information in one place.

The preliminary guidelines define the value of a speed study and describe various methods for conducting a study. They cover how to analyze study data and other factors that affect speed, including access points, crash statistics, land use and enforcement resources.

WisDOT plans to finalize the guidelines after getting input from the April 16 Summit, a forum Hungness says is central to producing speed management guidelines that give decision makers a reasonable, evidence-based approach to setting and changing speed limits. Yao adds, “We want this to be a Wisconsin document, not a DOT document, a resource local officials find truly helpful.”

Participants will receive a draft of the guidelines to review several weeks before the Summit, which takes place April 16 in Stevens Point.

Guidelines outreach continues later this year when WisDOT conducts training programs about the speed management guidelines in conjunction with the Transportation Information Center (TIC). See adjacent article and the Crossroads calendar for more information.

Workshops planned on speed guidelines

Local governments that want to modify a statutory speed limit or change an existing speed zone must conduct an engineering and traffic study. The Wisconsin Speed Management Guidelines give local officials a handbook to follow as they prepare their proposals. TIC is conducting a May workshop series about the new guidelines and encourages all local officials involved in speed zoning—including engineers, street supervisors, law enforcement officers and elected officials—to attend one of the five sessions.

- May 19 in DePere
- May 20 in Waukesha
- May 21 in Barneveld
- May 27 in Eau Claire
- May 28 in Weston

Enforcing limits is critical to speed management.
practiced eye and quickly grasp the design flaws of the existing road," says Gerlach, an engineer and retired highway commissioner. “I knew it could be done and we came to agree on first steps and workable improvements.”

The goal of the Transportation Information Center’s Safety Circuit Rider program is to explore easy-to-implement safety upgrades. Gerlach outlined a straightforward plan that involved realigning the road at the hillcrest, flattening the back slope to the north and restriping the centerline. He also began to research funding options from state and federal sources to help pay for the changes.

At his recommendation, the town took immediate action to reduce traffic speeds on the road. They installed advisory 35 mph speed limit signs at both approaches to replace the standard 55 mph.

**Cooperation carries the day**

The push was on, according to Zeman. Chippewa County prepared estimates of approximately $40,000 for the project. Zeman contacted Dover officials to discuss sharing costs and labor. They asked the property owners for easements to correct the back slope.

It turned out the project did not qualify for safety improvement funds because the most severe crash on the road did not

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**The momentum of exemplary intergovernmental cooperation carried the day.**

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**BARRON COUNTY** Town of Dover

**CHIPPEWA COUNTY** Town of Auburn

An aerial view of original road shows the compound curve that made it unsafe. Reconstruction eliminated the curve and flattened the back slope to the north, improving visibility and safety.

**Total construction cost**
Just over $33,000

**New road**
A much straighter 620 feet of pavement with flatter slopes and good sight lines

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**BEFORE**

Looking west on 250th Avenue from the center of the hilltop curve.

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**AFTER**

Looking west after realigning the road at the hillcrest and leveling the back slope.
take place within the required three-to five-year window. But the momentum of exemplary intergovernmental cooperation carried the day. As far as Auburn was concerned, the 250th Avenue project was underway.

Town crews started to clear trees, haul dirt and grade the incline. They hauled excess fill to an adjacent farm field for future use and cut up cleared trees for firewood. A local paving contractor ground up the old blacktop to use as part of the 12-inch base course then finished the newly straightened roadbed with 2.5 inches of compacted hot mix asphalt. Crews from Baron County did the striping.

Zeman says after working with Gerlach, Auburn was prepared to do the project on its own just to make it happen right away. But the Town of Dover came through and paid their share. Now residents of both communities and visitors to the area share the benefit of a better, safer road.
This index features articles that appeared in the past eight issues of Crossroads, listed by topic and title. Look for these issues and previous indexes online at http://tic.engr.wisc.edu/ or call the Transportation Information Center at 800-442-4615 to request copies.

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Guidance for Improving Roadway Safety Understanding Minimum Reflectivity, website sponsored by highway engineering and safety groups provides information about assessing current sign inventory, developing a replacement plan, replacing non-compliant warning and regulatory signs, and guidance and street name signs to meet new MUTCD standards.
http://www.minimumreflectivity.org/index.asp

Publication

Using Weight Limits to Protect Local Roads, TIC Bulletin #8, 8 pp., 2003. Available from TIC. Discussion of strategies local officials use to establish weight limits and protect vulnerable roads.

How Vehicle Loads Affect Pavement Performance, TIC Bulletin #2, 4 pp., Available from TIC. Examines facts about pavement fatigue and the effects of wheel loads.

Careful process prepares way for action on weight limits, lead story in Fall 2007 issue of Crossroads transportation newsletter, published by TIC, profiles the steps taken by the central Wisconsin Town of Hull to establish new local limits on heavy truck traffic. Available for download from TIC website.

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DVD/VHS/Multimedia
Timely resources new to the TIC collection or related to topics in this newsletter.

Safe Tree and Brush Removal, Illinois Department of Transportation, 2003, 19 min., #18668, now available in DVD. Reviews tree/brush removal practices, tool maintenance, and safe skills for tree cutting, stump removal and tree trimming.

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Please fill out this form and fax or mail (in separate envelope) with the mailing label below.

TIC Workshops
Details, locations and registration forms are sent to all CROSSROADS recipients prior to each workshop. Additional workshop information and online registration available at http://tic.engr.wisc.edu/workshops/listing.lasso

Using Speed Management Guidelines
In-depth review of new guidelines designed to provide local officials with a handbook on how to prepare for modifying speed limits on local roads. A valuable session for engineers, street supervisors, law enforcement officers and local elected officials. Fee: $45

May 19 DePere
May 20 Waukesha
May 21 Barneveld
May 27 Eau Claire
May 28 Weston

On-Site Workshops
Bring instruction to your shop or office and save time and travel costs. Schedule training that is convenient and tailored to your specific needs. On-site workshops let you train more people for the same cost or less, including staff from other municipal departments, nearby communities, and businesses you contract with. Contact TIC to book the program and date you want. On-site workshops include:

- Basic Surveying for Local Highway Departments
- Basic Work Zone Traffic Control
- Flagger Training

UW–Madison Seminars
Local government officials are eligible for a limited number of scholarships for these Engineering Professional Development courses held in Madison. For details go to http://epd.engr.wisc.edu or 800-462-0876.

APRIL 2009

20-21 Drainage Engineering Fundamentals for Non-Engineers #K416
29-30 Fleet Management: Effective Practices for Public and Private Fleets #K326
29-5/1 Watershed Modeling Using the New HEC-HMS #J968

MAY 2009

4-6 Using HEC-RAS to Compute Water Surface Profiles for Floodplains, Bridge and Culvert Hydraulics #J969
6-7 Highway-Rail Grade Crossing Safety Course #K335

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15 Computer Tools for Engineering Project Management #K030

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10 Principles and Practices of Construction Project Scheduling #K032
11-12 Principles and Practices of Estimating for Construction and Design Professionals #K033

CALENDAR

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