Estimating road and street improvement projects

ROAD CONSTRUCTION costs have seen big increases in the past three years. Gone are the days of price stability when it was easy to assume project costs would rise only a few percentage points annually.

Estimating road and street improvement projects is harder today given substantial increases in material and transportation costs, and volatility in the price of improvements. One way to minimize surprises is to follow good practices for estimating project quantities and costs.

Preliminary vs. detailed

Preliminary estimates of construction costs come in handy when developing a road-improvement plan and budget. If you do this planning in WISLR, the Wisconsin Information System for Local Roads that has a built-in cost database, you need to modify your numbers in WISLR to account for price increases and local differences in costs. Also adjust for the type of maintenance and construction activities you plan to implement. Consider including a contingency of 5-to-10 percent in estimates to anticipate unseen price increases or additional work.

Numbers used in a preliminary estimate represent an average, or typical project. Many projects, however, differ from the average. Before putting a project out for bid, make a more-detailed cost estimate of actual construction costs on the project. ►

Idea EXCHANGE

Brine-making facility speeds process

REDUCE THE AMOUNT of salt spread on icy roads and bridges, and improve the effect of what you ***do*** lay down. The Dane County Department of Public Works, Highway and Transportation took up that challenge two plowing seasons ago and now treats its roads by a process of prewetting with a salt-brine solution that mixes with the salt—an application that saves salt and acts more quickly. To supply its brine needs, the Department built a new facility at its Madison headquarters to house a precision-run brine-making process.

The set-up includes computerized controls for programming the process, a 2.5-yard container for mixing the brine solution, and two 4,000-gallon holding tanks adjacent to a truck port where vehicles stop to "fuel up" with the solution. The county also transfers brine to 3,000-gallon storage tanks at six outlying facilities as needed.

Crew Leader Gary Keegan describes the brine-making process as fast and efficient. "It makes it easy to meet our needs and even supply other counties." After his crew loads a measure of rock salt into the container and programs the brine-making run, water sprays on the salt from overhead. Spray sensors monitor flow to achieve an exact 23 percent solution, the salinity Keegan says addresses most county winter road conditions. Sensors guard against overflow and shut the spray down when the salt gets too low.

Brine making in this operation is a continuous process that produces approximately 8,000 gallons of brine in two hours. With greater water velocity, Keegan predicts they could speed production substantially. The facility produced 130,000 gallons of brine last year.

The county piloted the in-house process in 2005 and ran it full out in 2006. Its anti-icing operation involved two trucks equipped with 1,800- and 1,000-gallon tanks to treat bridge decks on state routes and county routes with heavy traffic. The trucks go out when there are predictions of frost or light snow with pavement temperatures at 10-to-35 degrees.

Twenty-five trucks are equipped for prewetting. The county expects to put six more in service this year, all assigned to state routes. Costs amount to approximately $7,000 per truck for retrofitting and $5,000 to equip a new truck.

Dane County Highway Commissioner Gerald Mandli says the Department anticipates over time the cost-effective operation will reach its goal to reduce salt use up to one third and improve road safety. ■

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Gary Keegan uses touch-screen controls to program salinity and view the progress of the run. INSET *The large 2.5-yard mixing bin is mounted in an enclosure adjacent to computer controls.*

For a detailed estimate, you need to know what the specific items of work are and where the project will physically start and stop. You need to take measurements and observe existing conditions.

Field information

The most basic information you need is the length and width of the road. Measure length along the centerline with a measuring wheel or along each pavement edge, averaged to find the centerline length. Measure width with a measuring tape in several places, noting where changes in width occur. If variations are minor, average the measurements to find the width.

If you have road length and width measurement information on file and are confident of its accuracy, use it instead to calculate project quantities. Be sure to add in street radius returns and other additional pavement areas included in the proposed improvements. All these measurements go into the formula for calculating square yards of pavement in the project.

While in the field, take note of other work you will need to do at the same time. Identify and measure areas that require patching and pavement markings that will need repainting. Also note signs that need replacing.

Look for safety problems—trees too close to the road, shoulder edge drop offs, poor sight distance, protruding headwalls, hazardous mailboxes, missing or damaged guardrail, and other potential problems. Consult the SAFER Manual from the Transformation Information Center (TIC) to identify hazards and prioritize safety improvements.

Check for drainage issues on the road slated for maintenance. Plan and coordinate ditch cleaning and culvert replacement work with pavement improvements.

For urban roads, identify deteriorating curb and sidewalk sections for replacement. Evaluate the need for handicapped accessible sidewalk ramps with detectable warning fields.

Gather data on any additional work identified and decide what to include in the bid. If you plan to do work in-house that must be coordinated with the contractor, describe it in your bid specifications.

Estimating quantities

A good quantity estimate is the foundation of a fair bidding process. Provide work items and quantities on the bid proposal form to ensure all contactors submit bids that follow the same specifications. A basic set of bid documents and specifications, including a bid proposal form, are available from TIC.

Resources to help with calculating quantities of gravel and asphalt materials include the *Inspectors Job Guide and Highway Maintenance Tables* from TIC. The Wisconsin Asphalt Pavement Association has useful information on its website that discusses materials and specifications, and gives examples of estimating quantities.

Sample quantity estimate from Wisconsin Asphalt Pavement Association

SPECS

22-foot wide asphalt road

6.7 miles long

SOLUTION

Roadway area =
22 ft x 6.7 mi x 5280 ft/mi =
778,272 SF

778,272 SF ÷ 9 SF/ SY = 86,475 SY

Total seal coat quantity = 86,475 SY

Construction costs

With measurement and quantity information in hand, the next step is getting data on current unit prices.

Good outlets for timely, relevant cost data are neighboring cities, towns and villages, and the county highway department. Ask for information about project size and scope to determine if the project is similar enough to yours so cost data will be useful. Since haul distances affect the price of materials, use cost data from nearby communities or locations with similar access to materials.

While recent projects with similar specifications are a good source of information, you will need to adjust for cost increases. The Federal Highway Administration website provides information on construction economics and price increases.

Project size and type have a major effect on unit prices. The per-ton price for a small amount of asphalt surface patching may be double or triple the price per ton of an asphalt resurfacing job due to differences in equipment used and the economies of scale.

Local contractors are another helpful source for cost information and several consultants in Wisconsin provide access on their websites to bid tabulations for recently bid projects. If projects listed are geographically close and similar to yours, these tabulations can be helpful.

WisDOT posts average unit prices for pay items on state contracts on its Highway Construction Contract Information (HCCI) website. It features a visual view of year-to-year increases statewide that helps with preliminary costs estimates.

Pulling it all together

WisDOT's *Controlling Item Cost Estimate Worksheet* lists common major items for road construction projects and serves as a checklist for the complicated but important process of estimating your road and street improvement projects. The project scoping tools provided by the department help local governments pull quantities and estimated unit costs together. ■

Helpful links

Wisconsin Asphalt Pavement Association website with links to "local specifications" calculation tables.
www.wispave.org

US Department of Transportation Federal Highway Administration link to information about construction cost increases and competition.
www.fhwa.dot.gov/programadmin/contracts/price.cfm

WisDOT Highway Construction Contract Information (HCCI) website.
http://roadwaystandards.dot.wi.gov/hcci/bid-letting/reports/aupfy05-07.pdf

WisDOT created this helpful *Controlling Item Cost Estimate Worksheet* tool for organizing project estimates.
www.dot.wisconsin.gov/localgov/highways/tools.htm

Request the *Inspector's Job Guide and Highway Maintenance Tables* and sample specifications and bid documents from TIC. Call 800-442-4615 or order online.
http://tic.engr.wisc.edu/publications.lasso

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