the process and makes inputting, standardizing, and retrieving information quicker and easier.

"In that way, it's the same as when you do it on paper," said Thomas Le Diouron, principal engineer for Advitam. "The inspector will come up with procedures for what is being examined and what they're looking for. Those aren't decisions we make. But our system can force the inspectors to respect the guidelines they establish and can ensure consistency year after year."

An example of the software's advantage is its ability to link photos, forms, and drawings electronically. An inspector walking the bridge and taking pictures will input the information into the software program using a tablet PC, thereby eliminating the extra (and often mistake-prone) step of returning to the site office and reproducing the information there.

"Let's say I'm inspecting the bridge, and I see a crack," explained Le Diouron. "I write it down on my form and give some information — how big it is, the color. Then I take a photo. At that point, I would just write down, "photo number 122" in the associated field in the computer. When I get back to the office, the system already knows that photo 122 is associated with that particular crack and it can retrieve that photo from the digital archive."

The inspection process, data processing, and report writing still take time, noted Le Diouron. However, it can be measured in days, rather than weeks — and usually, the bigger the project, the greater the time savings.

The Zilwaukee Bridge

Advitam's first foray into the U.S. market came in 2001 on the Zilwaukee Bridge in Michigan, a project that resulted in an alliance between Advitam and Finley-McNary Engineers. Finley-McNary, invited to propose on the Zilwaukee Bridge inspection, saw a perfect opportunity to take a modern approach to bridge inspection and data retention and based its proposal on using Advitam. Initially, the Michigan Department of Transportation (MDOT) was cautiously enthusiastic. After being assured that the data would be stored in easily accessible, Microsoft- and AutoCAD-based files, MDOT agreed to use Advitam on the project.

Completed in 1988, the Zilwaukee Bridge is a twin, 2.5-km-long precast segmental viaduct carrying I-75 over the Saginaw River. As part of the contract between MDOT and Finley-McNary, Advitam supplied the ScanPrint software system, field inspection hardware (including hand-held computers), training, and technical assistance.

Tablet PCs and handheld devices allow bridge inspectors to record inspection details in the field, as well as to link CAD drawings and digital photos to each record.

The data was transmitted from Michigan to Finley-McNary's main office in Tallahassee, Fla., where the project manager and the analysis team reviewed the information daily. This improvement in data-sharing ability saved time and allowed the analysis team to redirect the field inspection team to gather more information in areas of concern quickly and precisely.

"When we did inspections on paper, we'd have a shelf-and-a-half full of three-ring binders with 8.5-by-11 templates," said Richard M. Smith, P.E., bridge inspection program manager for MDOT. "That worked fine in the paper age, but we're moving into the electronic age and we wanted to keep the information in a format where we could get at it and make sense of it. We needed something that's more than just a document handler, and Advitam gives us that."

Following the success of its first program with the Zilwaukee Bridge, MDOT requested that Advitam input all data from the bridge's previous inspections into its system, including 706 CAD drawings, 11,495 deterioration records, 5,800 inspection form records, and 558 photos. As a result, all inspection data from 1993 forward is now in the system.

The system also divided the bridge's structure into more than 700 elementary components (such as piers, bearings, abutments, inside of box girder, outside of box girder, expansion joint), each associated with a corresponding inspection drawing and inspection form. At each inspection, inspectors using pen tablet PCs can report deterioration on drawings in separate layers for each inspection, fill in forms, give ratings, and associate photos and comments with any record.

The Rion Antirion Bridge

Advitam took its work a step further on the Rion Antirion Bridge in Greece. This time, instead of waiting to implement the system until it was time for an inspection, Advitam put its inspection and monitoring program in place during construction.

With so many components and hazards to consider, Advitam established a cross-tabulated table taking all the various issues into account. This allowed the project team and inspection professionals to determine which hazards were likely to affect which components. For example, if seismic activity affected a particular component, the project team could implement specific monitoring and inspection standards and equipment to address the issue.

"This process allowed them to see each component, how critical it is, and how vulnerable it is to various hazards," said Le Diouron. "There was concern that vibration would create fatigue of the steel connection [between the deck and the cable stay]. They had two possibilities — inspect this component every few months, or install gauges to continuously monitor the stress in the steel component. The owner asked us to design and supply instrumentation to specifically monitor that situation."

Conclusion

This type of electronic data-retention system for bridge inspections has shown repeatedly that it increases efficiency and saves money well beyond the cost of the system. ■

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