

Transportation—Managing Structural Safety of Bridges

Summary

What we examined

The Department of Transportation is responsible for building and maintaining bridges on the Province's highways. There are currently 4,400 bridge structures, comprised of 1,600 bridges and 2,800 bridge-sized culverts. The Department estimates the replacement value of these bridge structures to be \$6.7 billion.

Our objective was to assess if the Department of Transportation has effective systems to manage the structural safety of bridges. To do that, we examined if the Department has adequate processes to:

- assess the condition and safety of bridges and identify work that should be done
- maintain the bridges to keep them safe and protect Albertans' investment
- determine future needs for bridge rehabilitation and replacement

The Department conducts two types of inspections:

- Level 1 inspections, which are visual assessments of the bridge's condition, using basic tools and equipment
- Level 2 inspections, which are in-depth inspections using specialized equipment

Conclusion

We concluded that the Department generally has well-designed systems to manage the structural safety of bridges. However, we had several significant findings where those systems were not operating as they should. We also found that the Department did not adequately track or report the actions taken in response to bridge inspections. Consequently, the risk of the Department not maintaining bridges to ensure structural safety and not protecting Albertans investment is unnecessarily high. We did not find evidence of unsafe bridges.

Notwithstanding the significance of our findings, the Department believes that it should be able to deal with the deficiencies relatively quickly.

Why it is important to Albertans

Well-maintained bridges are necessary to ensure the safety of Albertans and protect their investment. Many of Alberta's major industries rely on the highway system to move goods.

What we found

Inspections, standards and training—the Department visually inspects bridges to identify safety issues and maintenance needs. It has developed comprehensive standards and guidance documents for inspections, and it trains and certifies inspectors to perform inspections based on the standards. Its inspection forms capture the information the Department requires to identify immediate maintenance needs and assess changes in structures that need more investigation. The Department also has standards for in-depth inspections and these are similarly well structured and documented.

Actual inspection practices—the Department does not regularly monitor access to the computer system it uses to manage the bridge inventory and inspections. It also does not regularly monitor whether inspectors have valid certification. Not all bridges were visually inspected as frequently as the Department's standards require.

Monitoring of inspections and contractor performance—the Department has designed good monitoring processes, but has not consistently followed them. Spot audits did not occur for two of the prior four years, despite being a requirement of the Department's process. It also lacks good processes to remedy poor performance by contracted inspectors.

Transportation—Managing Structural Safety of Bridges

Monitoring of remedial action—the Department's information systems capture inspection results but do not track findings to resolution. Its processes to accumulate inspection findings and monitor that the right remedial action is taken are inadequate. The Department has assigned responsibility for bridges in each of four regions to the regions' bridge managers. They track maintenance work with spreadsheets. The regions do not track priority recommendations through to their resolution, such as requesting a level 2 inspection, increasing monitoring or repairing the bridge.

The Department's timelines for resolving deficiencies that level 1 inspections ranked as high priority were followed for deficiencies rated 1 out of 9. For deficiencies rated 2, regional bridge safety staff did their own assessment, but did not track whether they concluded that maintenance was required, or whether it was done. Senior management does not require its regional offices to report their maintenance activities, so does not have assurance that appropriate action was taken.

Capital planning—the Department's systems to use inspection results to determine the optimal time to rehabilitate or replace bridges are well designed and work as designed. The Department's 2012–2017 capital plan submission says it needs about \$900 million over the next 10 years to replace bridges. The Department can show that the age and condition of bridges means that current funding—of about \$25 million annually—will be inadequate. The Department communicated its strategy to manage the shortfall; it will reduce the posted maximum weight of trucks using the bridges or close the bridges.

The Department did not fully follow the prescribed format for submitting information on its bridge capital needs. More importantly, we believe the Department could have provided better information to the Department of Treasury Board and Finance to allow decision makers to better understand the risks of different funding levels on safety, service levels and future funding needs.

What needs to be done

The Department needs to improve the quality and timeliness of inspections, contracting processes and use of data. Weaknesses in these areas limit the Department's ability to conclude that the bridges are maintained to its standards to maximize use and minimize cost over the life of each bridge.

We recommended that the Department:

- improve its processes for visual inspections of bridges—Recommendation 1
- better monitor that contractors comply with standards and ensure they are properly certified—Recommendations 2 and 3
- ensure timely bridge inspections—Recommendation 4
- improve contracting processes for visual inspections and regularly assess if contracting out the inspections is cost effective—Recommendations 5 and 6
- better control access to its information systems for bridges—Recommendation 7
- improve regional reporting of inspection results and remedial actions—Recommendation 8
- improve its capital planning submissions—Recommendation 9

Audit objective and scope

Our audit objective—to assess if the Department has effective systems to manage the structural safety of bridges.

Scope of audit—we examined the Department's systems to manage 4,400 bridges on the provincial highways in service during the fiscal year ended March 31, 2011. We did not examine systems to manage bridges on local roads owned by the Province but managed by municipalities or cities. We conducted our audit work between April 2011 and August 2012.

We examined the Department's systems to:

- establish standards for inspecting and maintaining bridges and large culverts
- perform the inspections and do maintenance
- identify when bridges need major rehabilitation or replacement

We used a structural engineer with a background in design and maintenance of bridges to help us assess the design of the Department's inspection system. Our expert reviewed the Department's inspection manuals, training and certification process, and quality assurance process. He also reviewed the Department's bridge expert analysis and decision support system tool (BEADS tool) used by the Department to calculate when to rehabilitate or replace bridges.

We used another structural engineer to perform 10 inspections for us and aid us in assessing the completeness of the Department's inspection manuals and the ease of using them when performing the inspections.

Background

The Department is responsible for building and maintaining provincial highways, including all bridges and culverts on the highway network. Bridges and culverts on local roads are generally the responsibility of municipalities, towns and cities.

Bridge types—the Department classifies bridges as follows¹:

- Major bridges are typically built from site-specific drawings but can also be built from standard girder drawings. Typically, major bridges are river crossings, highway interchanges or railways crossings.
- Standard bridges are built using standard bridge design drawings and generally are comprised of standard precast girders, with steel or concrete substructure elements, and supported on steel or concrete piles. Typically, standard bridges are river crossings.
- Culverts are cylindrical structures made of metal or concrete. They manage water flows under roadways. Bridge-size culverts have a diameter at least 1,500 mm, or where several culverts are at the same location, the total diameter of all of them is at least 1,500 mm.

The Department manages about 4,400 bridge structures:

• Major bridges	1,000
• Standard bridges	600
• Culverts	2,800

All bridges have a number of components. For major and standard bridges, the components are the approach road, the superstructure (top of the bridge), the substructure (foundation of the bridge), and the channel the bridge passes over. Each component can include several elements. For example, the superstructure includes several elements such as the railing, deck and girders. Main culvert components are the approach road, the culvert barrel, the upstream and downstream ends of the culvert, and the channel.

The Department's tools to gather information—the Department has developed tools to compile all information on the bridge inventory and collect data generated by bridge inspections.

Inspection types and program—the Department designed an inspection program to assess the safety of bridges, identify if maintenance is needed and when, and provide information to decide when bridges should be either rehabilitated or replaced.

Inspection is one of the key components of any bridge management system. The Department has established two types of bridge inspections and documented the standards for each type in inspection manuals:

- Level 1 inspections are visual assessments of the bridge's condition, using basic tools and equipment, performed on all bridges, and on culverts with diameter of 1,500 mm or larger.
- Level 2 inspections are in-depth inspections using specialized equipment. They are conducted on bridges that have known structural deficiencies or need frequent monitoring due to age, design or traffic.

¹ Department of Transportation's website – www.transportation.alberta.ca

Transportation—Managing Structural Safety of Bridges

The Department does ultrasonic testing of older steel bridges to check for cracks in places where steel parts are connected.

The Department also tests concrete bridge decks, which included removing small samples of concrete from the bridges and testing them in a lab to check the chloride content. High chloride levels may accelerate the corrosion of the reinforcing steel.

The Department determines the frequency of both types of inspection.

- All bridges have level 1 inspections, at a frequency between 21 and 57 months, depending on the type of bridge and the type of roadway it's on.
- About 600 bridges with concrete decks and 120 bridges with metal trusses have level 2 inspections at four- to six-year intervals. The Department schedules tests for about 120 concrete decks and 20 bridges with metal trusses annually.
- All other level 2 inspections, described in the level 2 inspection manual, are performed as needed.

Through membership in professional and industry associations, the Department receives information about bridge failures in other places. It uses this information to evaluate whether its bridges are susceptible to factors causing the other bridge failures. When the Department detects these conditions, it will inspect the affected bridges and repair them if necessary.

The Department's manuals detail the:

- qualification and training of bridge inspectors
- rating scale inspectors use in level 1 inspections to assess bridge conditions
- bridge information system that stores data on bridges and level 1 inspection results

All bridge inspectors must complete the Department's training and certification program. Two levels of certification are available: Class A inspectors can inspect all bridges, while Class B inspectors can inspect only standard bridges and culverts. Candidates must pass exams based on classroom training and obtain sufficient experience under the guidance of a Class A inspector.

The Department initially certifies inspectors for three years, with the option to renew the certification. A three-person panel of senior Department bridge people assesses the number of inspections the applicant completed in the prior three years, and any knowledge they have of the quality of the applicant's work and recommend re-certification to the director of bridge engineering. When the director approves the application, the applicant's certification is renewed for another three years.

Outsourcing level 1 inspections

The Department outsources level 1 inspections. Contracts are for three years, and include doing the inspections, reviewing the results for completeness and compliance with the standards, and data entry. The Department issues requests for proposals that outline the qualifications of inspectors and reviewers, the criteria the Department will use to assess the proposals, the total number of structures to be inspected in the three years, and the average number of inspections per year. The Department also contracts with successful applicants to review the inspections reports for local roads, where the municipalities use the Department's information system to manage their bridge inventory.

Regional bridge managers are required to inform the contractors (at the start of each quarter in the fiscal year) of the bridges they must inspect in that quarter. By the end of the quarter, the contractors must inspect, review, and enter the inspection results into the Department's information system. Contractors must provide electronic and hard copies of the inspection reports to the Department within one month of the inspection date. The Department's bridge managers, or their designates, must approve the inspections before the bridge inventory is updated for the results of bridge inspections.

In addition to the contractors' review of the inspections and the Department's review and acceptance of the inspections, as described above, the Department's quality assurance process requires annual audits of inspections to assess whether contractors followed its standards in completing the inspections. The Department's process is to annually select two regions, re-perform a sample of inspections, and compare the results.

Two Department Class A inspectors re-perform the inspections and evaluate the quality of the inspections. The Department uses a four-point ranking, from 1 (unacceptable) to 4 (very good), to evaluate the overall inspections, the completeness of the maintenance recommendations, and the quality of the inspectors' assessments of the four main components:

1. The approach road, signing, and utilities
2. The superstructure
3. The substructure or barrel for culverts
4. The channel

The Department reports its findings, including any non-compliance with the standards, to the Bridge Inspection and Maintenance Committee.

Findings and recommendations

Design of level 1 visual inspections

Recommendation: Improving inspection process

1 RECOMMENDATION

We recommend that the Department of Transportation improve its inspection processes by ensuring that it collects all the information it needs to assess the quality of inspections.

Criteria: the standards for our audit

The Department should have a bridge inspection program that evaluates bridges against prescribed standards and recommends appropriate maintenance strategies:

- Detailed visual inspections should be performed regularly.
- The entire history of the bridge should be properly documented and easily accessible to inspectors.
- Inspectors should be qualified and properly trained.
- A quality assurance process should be put in place to verify the reliability of the data generated during the visual inspections.
- Comprehensive assessments involving invasive or destructive techniques should be done as soon as a significant change in the condition of the bridge is noted or the structure is found to be in an overall poor condition.

Our audit findings

Key findings

- The Department has well-structured and comprehensive manuals to guide inspectors and the inspection forms are clear and well organized.
- The Department does not collect information on the time spent for inspections and the number of inspections done in a day.
- The Department does not assess whether the number of inspections done in a day and the time spent on inspections affects the quality of the inspections.

The Department's approach to bridge inspection is similar to approaches of other international jurisdictions. It is based on visual examinations. We found the following:

- The Department has well-structured and comprehensive manuals that inspectors can rely on when performing inspections. They provide abundant information on the different degradation phenomena likely to affect each type of material in bridges and culverts. The bridge inspection manuals have detailed recommendations on how to inspect structures.
 - The Department's policy to modulate inspection frequency according to the characteristics and condition of the structure is reasonable and in line with the practices of other transportation agencies in Canada.
 - The forms to be filled out by inspectors are a strong point in relation to other Canadian jurisdictions. The inspection forms for both level 1 and 2 inspections are adequate tools to ensure uniformity and completeness of information collected during inspections. The information in the forms is clear and well organized and the forms have the flexibility to adequately handle a variety of bridge structures with special features.
 - The system used to rank maintenance activities is adequate and the timelines established for maintaining and repairing bridge structures are reasonable.
- Similar to other Canadian jurisdictions, the Department requires bridge inspectors to be certified. The Department's certification process requires candidates to take the Department's training courses, pass exams and complete inspections under the supervision of a certified inspector.
 - The Department's manuals and training materials are well structured and well written.
 - The requirement for a second contractor to review each inspection report before it goes to the Department should improve the quality of inspection data in the Department's system.
 - The Department's manuals provide inspectors performing level 1 inspections with guidance on when to recommend level 2 inspections, for specific conditions that are visible or apparent. This could include recommending level 2 inspections to take core samples for timber elements or taking detailed culvert barrel measurements.
 - The Department's head office bridge staff schedule level 2 inspections for concrete decks and trusses. Based on the results, they determine if changes need to be made to the regular inspection cycle. They also may schedule other specialized inspections based on specific conditions of bridges. The Department's manuals provide sufficient guidance to inspectors on performing these inspections.

But the Department can improve the design of the level 1 inspection process. The Department does not require inspectors to record the travel time between bridges, or the start and end time of each inspection. It cannot tell whether the number of inspections done in a day, and the time spent on each inspection, affect the quality of inspections. Neither can it tell if the rates it pays for inspections are reasonable.

The Department has not issued guidance on the time required to complete a bridge inspection in accordance with its standards. Several factors such as the age of the bridge, its size and accessibility, would prevent using one average time for all structures. However, time estimates could be useful to the Department when selecting inspections for its spot audits.

We think that the Department should assess whether the time spent doing the inspections and the number of inspections done in a day reduces the quality of the inspections. The 2011 spot audits found 36 maintenance recommendations that inspectors had missed for the 12 inspections tested. The same contractor had done several inspections in one day. In the 2008 spot audits, a contractor with below-average performance had done more than 10 inspections in one day.

Implications and risks if recommendation not implemented

The Department may not have all the information it needs to remedy poor contractor performance. This increases the risk that deficiencies that affect safety will be missed or repairs necessary to protect the investment will not be done.

Quality of inspections

Background

The Department established the Bridge Inspection and Maintenance Committee to deal with operational and developmental issues in its bridge information system. These include identifying operational problems and making recommendations, such as the need for an audit to ensure the accuracy and consistency of information reported in the systems.

Recommendation: Assessing quality of inspections

2 RECOMMENDATION

We recommend that the Department of Transportation regularly assess whether contractors perform inspections following its standards and take corrective action if they do not.

Criteria: the standards for our audit

The Department should have a process to assess whether contractor inspections follow the standards and what corrective actions to take based on the results.

Our audit findings

Key findings

- The Department developed a spot-audit process to monitor the quality of inspections but did not follow it consistently. Spot audits were not done for two of the prior four years.
- Spot audits found inaccurate inspection ratings.
- The Department lacks a process to remedy poor contractor performance.

We examined the Department's audit reports of contractors' work to its bridge inspection and maintenance committee in December 2008. The Department had not followed its own process. It selected only one contractor for testing in each of 2007 and 2008, and did no spot audits for 2009 or 2010. Despite assessing one contractor's performance as below average, the Department did no spot audits of this contractor in 2009 or 2010. So it could not show that it had remedied the contractor's poor performance.

Transportation—Managing Structural Safety of Bridges

We could not assess what the committee did in response to the audit results because the committee did not meet between December 2008 and December 2011. The Department selected contractors for the three-year period starting April 2009, within a few months of the December 2008 committee meeting. Therefore, we wanted to assess whether the Department considered the results of the spot audits when selecting contractors. Four members of the committee, who were present at the December 2008 meeting, were on the selection committee for the 2009–2012 contract. The Department excluded performance from its selection criteria. The Department said the purpose of the spot audits is not to influence contractor selections—it is to ensure that the Department is getting good inspections.

In 2011, the Department re-performed a sample of inspections in one region, and concluded that the inspections met its standards. But it did not select for review contractors it had previously assessed as below average, or contractors it had not assessed.

Our review of the Department's 2011 spot audits found that:

- For 11 of the 12 structures the Department re-inspected, its staff found 36 maintenance recommendations that should be done in 2012 that contractors had not identified.
- The Department's staff consistently rated the condition of some bridge parts lower than the contractor's inspector did.
- An inspector who performed 8 inspections in one day missed 26 maintenance recommendations. Of the 1,700 inspections done in the 2010–2011 fiscal year, on 75 days, inspectors did 10 or more inspections in one day.

The Department lacks a process to remedy poor performance by inspectors, such as requiring inspectors to take additional training, or monitoring the quality of future inspections, or re-testing their knowledge of the inspection standards.

The Department has not established risk factors for selecting which inspections to check. Risk factors could include the number of inspections done by individual inspectors, large numbers of inspections per day, or prior poor performance.

Implications and risks if recommendation not implemented

Inspections may not meet the standards in assessing the quality of the bridge elements and may not identify all required maintenance. This increases the risk that deficiencies that affect safety will be missed or repairs necessary to protect the investment will not be done.

Inspector certification

Recommendation: Proper certification of contractors

3 RECOMMENDATION

We recommend that the Department of Transportation ensure that contractors who perform inspections are properly certified.

Criteria: the standards for our audit

The Department should accept inspections only if the contractors who perform and review them have valid certification.

Our audit findings

Key findings

- The Department overrode its control to ensure that only inspections completed by certified inspectors can be entered into the bridge information system.
- About 50 per cent of inspections were done by inspectors whose certification had lapsed.

When the Department renewed inspectors' certification, it followed its process. A three-person panel of senior bridge people recommended the re-certifications and the Director of Bridge Engineering approved the panel's recommendations.

The Department did not monitor whether inspectors were certified. In the year ended March 31, 2011, about 900 of the 1,700 inspections completed were performed by contractors whose certification had lapsed at the time of the inspections. About 200 inspections were reviewed by contractors whose certification had lapsed at the time of the reviews.

The Department has a control to ensure that only inspections completed by certified inspectors can be entered into the bridge information system, but overrode it for about half the inspectors. The system accepts inspection data only if the end-date of the inspector's certification is later than the inspection date. But one member of the three-person panel overrode the control by entering new end dates for inspectors whose certification had lapsed.

Implications and risks if recommendation not implemented

This increases the risk that deficiencies that affect safety will be missed or repairs necessary to protect the investment will not be done.

Timeliness and completeness of inspections

Background

The Department relies on the bridge managers in its four regions to ensure that all level 1 bridge inspections are done at the frequency the standards require. Bridge managers can run reports that list the dates inspections should be done, as well as overdue inspections for their regions.

The Department's head office schedules level 2 inspections for ultrasonic testing of bridge trusses and concrete decks. Any other level 2 inspections are scheduled by the regional bridge managers.

The Department keeps spreadsheets for the level 2 inspections with the dates of the last inspection and the date when the next inspection should be done.

Recommendation: Inspection of bridges

4 RECOMMENDATION

We recommend that the Department of Transportation ensure that bridges are inspected as frequently as its standards require.

Criteria: the standards for our audit

The Department should inspect all bridges as frequently as its standards require.

Our audit findings

Key findings

- Timing of bridge inspections followed Department policy in three of the four regions. In the fourth region, about 150 inspections were done more than a year after they were due.
- The Department's reporting processes did not identify that bridge inspections were late or missed.
- Department policy requires pedestrian bridges to be inspected, but regions did not inspect 15 pedestrian bridges because they considered them low risk.
- Regions did not inspect several structures and could not explain why.

Timeliness and completeness of level 1 inspections

Three of the four regions had effective processes to monitor that inspections were done when required; one region did not. This region's processes to schedule inspections did not include running the report of overdue inspections. It had not scheduled some bridges because it used its own system to identify when bridges should be inspected, and its system did not include all the bridges in the region. The region also scheduled all the bridges on one road for inspection at the same time, regardless of when the inspections were due. As a result, at March 31, 2011, the region had more than 150 inspections that were more than one year late.

Transportation—Managing Structural Safety of Bridges

The regions subsequently completed the inspections that were overdue at March 31, 2011, with the exception of:

- 15 pedestrian bridges that Department policy requires be inspected, but regions did not inspect because they considered them low risk
- seven culverts and two bridges that regions did not inspect and could not explain why

Timeliness and completeness of level 2 inspections

We examined whether the Department had scheduled level 2 inspections consistent with its timelines and concluded that they met their timelines.

Inspectors who perform ultrasonic testing must also do a level 1 inspection of the bridge. Head office needed to inform the regions when bridges would be inspected because the regions also scheduled level 1 inspections for almost all of the roughly 20 bridges in question, which led to duplication of effort and unnecessary expense.

Implications and risks if recommendation not implemented

Without inspecting bridges according to its standards, the Department risks having unsafe bridges open. The Department may not maintain the bridges at the optimal time.

Assessing whether to contract out program delivery

Recommendation: Assessing whether to contract out program delivery

5 RECOMMENDATION

We recommend that the Department of Transportation regularly assess whether it should contract out inspections or do them itself.

Criteria: the standards for our audit

The Department should periodically assess if it is more cost effective to outsource inspections or do them itself.

Our audit findings

Key finding

No analysis of the cost effectiveness of outsourcing the inspections has been done since 1997.

For the year ended March 31, 2011, contractors did level 1 inspections on about 1,700 bridges and culverts. The Department paid the contractors about \$650,000 to do this work. The contractors did the inspections in about 250 working days—about the number of days that one person works in a year. We recognize that there are bridges in all parts of the province and travel is required. We also recognize that there are qualitative considerations; the advantage of having enough inspectors available to complete the required inspections, and the disadvantage to the Department of not having a sufficient number of internal staff qualified to assess the inspection results. However, the Department did not assess its cost in relation to the time contractors spent doing the inspections, when it contracted for the inspections for either period: 2009–2012 or 2012–2015.

The Department does not have a process that requires its staff to assess whether it is more cost effective to outsource the inspections or have staff do them. The Department confirmed that since the government decided to outsource construction, inspection, and maintenance of roads and bridges in the mid-1990s, the Department has not assessed cost effectiveness of outsourcing—for at least 15 years.

Implications and risks if recommendation not implemented

Without a regular assessment of the costs and benefits of contracting out bridge inspections, the Department may not know if it is getting value for the money it spends on these services.

Contracting level 1 bridge inspections

Background

The Department outsources its level 1 bridge inspections, which include performing the inspections, reviewing them for accuracy and completeness, and entering them into the Department's bridge information system. It also outsources the review of local road inspections, as a service to municipalities that use its bridge information system to manage their bridge inventory.

The Department has established guidelines on contracting in its Project Administration Manual.² The manual provides guidance for establishing criteria and weightings for evaluating proposals.

Inspections for the year ended March 31, 2011 were based on contracts for the three-year period from April 2009 to March 31, 2012. The Department communicated the scope of the contract and requirements to applicants, including:

- total number of bridges in each of the four regions of the province, and the average number of bridges to be inspected annually.
- the number of contracts awarded to any contractor is limited to two regions.
- criteria for assessing proposals:

Project comprehension	20 per cent
Resource budget	30 per cent
Project control	5 per cent
Organization	5 per cent
Project team	40 per cent
Total	100 per cent

- inspectors certified by the Department. Class A inspectors for inspecting major bridges.
- Class A inspectors to review the inspections. The reviewers must have held the Class A inspection certification for at least five years and reviewed at least 50 of the Department's inspections in the prior three years.

Recommendation: Contracting level 1 bridge inspections

6 RECOMMENDATION

We recommend that the Department of Transportation improve its process to contract its level 1 inspections by:

- documenting how it establishes criteria for assessing candidates and awards points for each criterion
- ensuring proposal requirements do not limit qualified candidates

Criteria: the standards for our audit

The Department should comply with its Project Administration Manual when contracting inspection work for:

- The request for proposals should include criteria and the weighting assigned to each. A selection committee consisting of three to five experienced and senior staff should review the proposal and agree on the criteria.
- All criteria should initially be assigned the following minimum range value, and then adjusted based on project requirements to give a total score of 100:

Clarification and presentation	0 - 10 per cent
Project comprehension	10 - 30 per cent
Resource budget	10 - 20 per cent
Project control	5 - 10 per cent
Innovation	0 - 25 per cent
Project team	20 - 30 per cent
Past performance	30 per cent
Total	100 per cent

² *Project Administration Manual, October 2006.* www.transportation.alberta.ca/content/doctype29/Production/proj_admin_man.pdf

Our audit findings

Key findings

- The Department did not use its own guidance when establishing criteria, since it excluded past performance from its criteria.
- The Department has not established or documented how it awards points for criteria it uses to evaluate proposals.
- Proposal requirements limit eligible candidates.

We examined the Department's process to contract for level 1 inspections between April 2009 and March 2012 and found that:

- it had not documented how it established the criteria or what factors were awarded points for each of the criteria
- its documentation of the assessment of each proposal did not indicate what factors distinguished one bid from another, or how points were awarded to each
- it could not show how it had incorporated the results of spot audits into the selection of contractors or whether it even had, as it had dropped the performance criterion in assessing the bids, despite the manual's recommending using 30 per cent
- the proposal requirements limited eligible candidates. The proposal required contractors to supply reviewers who had reviewed at least 50 of the Department's inspection reports in the prior three years. This effectively eliminated any contractors who have not previously worked for or had not been employed by the Department.

The Department said that contractors who review local road inspections for municipalities could meet this requirement—if the municipalities use the Department's forms and system. But the Department contracts for the review of the local road inspections by the same contractors who perform and review the Department's inspections. The Department could not identify who, other than former employees, the previous contractors, or the firms now employing those previous contractors' reviewers, could meet its qualification requirements.

The contracts for three of the four regions were awarded to contractors who had been Department employees. One contract was awarded to a former employee who left the Department less than four months before the contract was awarded.

Implications and risks if recommendation not implemented

Without a rigorous, fair and transparent contract process, the Department may not be obtaining the best services for the best price.

Controls over access to the bridge information system

Recommendation: Controls over access to the bridge information system

7 RECOMMENDATION

We recommend that the Department of Transportation improve its processes to monitor access to the computer system that manages bridge inventory and inspections.

Criteria: the standards for our audit

The Department should have processes to grant and monitor access to the bridge information system to ensure that staff and contractors have only the access they need to perform their work.

Our audit findings

Key findings

- The Department does not regularly monitor access to the bridge inspection and maintenance system.
- Staff and contractors have access they don't need to perform their work.

Up to June 30, 2012, the Department had not monitored user access to the bridge information system.

The Department does not review the accounts of employees to check if their access roles are consistent with their job description. It also does not review the accounts of contractors to check if their access roles match their contractual obligations.

The Department lacks a process to monitor who had been assigned roles and make corrections. We found the following:

- Some contractors were assigned roles in the bridge information system that allowed them to both enter inspection results and accept the information. Only the department staff should be able to approve inspections, since one control over the quality of inspections is the department's review and acceptance of the results.
- Several contractors and about 20 department staff were assigned a role that would let them change the load capacity of bridges. Commercial road users rely on the accuracy of bridge load ratings when planning their driving routes.

Implications and risks if recommendation not implemented

The Department risks staff and contractors accidentally or intentionally creating errors in the information about bridges. Errors in the load ratings or bridges could reduce driver safety. Contractors could override Department's controls if they approved inspections they did.

Maintenance activities

Background

The Department budgets about \$15 million annually for maintenance. Typical maintenance for bridges includes minor repairs such as concrete patching, washing, sealing, repairing deck seals, and minor collision repairs. Each region gets a share based on the number of bridges in the region and costs relative to the other regions.

Recommendation: Maintenance activities

8 RECOMMENDATION

We recommend that the Department of Transportation improve the information that senior management receives on inspector activities, results, maintenance and other actions.

During level 1 inspections, inspectors assess the condition of the bridge components, and assign numerical rankings from 1 to 9, using the guidance in the level 1 Bridge Inspection Manual:

- Bridge elements rated 3 or less should have a maintenance recommendation.
- Maintenance recommendations can include any of the following: replacement, repair, rehabilitation, assessment, level 2 inspections, reduce inspection cycle or monitoring.
- Maintenance recommendations should indicate the recommended completion date.

The Bridge Inspection Manual states that the timing of bridge maintenance should generally follow established timelines, depending on the rating assigned to the component:

Rating	Timelines
1	Immediate action.
2	High priority, repairs and maintenance completed within six months.
3	For structural elements, repairs and maintenance should be completed before the next inspection. For non-structural elements, may be delayed if the defect does not impact the life and operation of the bridge.
4-9	Ranges from low priority to no action required.

Transportation—Managing Structural Safety of Bridges

The Department's head office staff schedule level 2 ultrasonic truss and concrete deck inspections. Results of these inspections go to the Department's head office staff, who review the inspection results and send the inspections and their recommendations to the regional bridge staff.

Criteria: the standards for our audit

The Department should ensure that regional staff review deficiencies the inspection process finds and take appropriate action.

Our audit findings

Key findings

- The Department does not track the results of inspections, their conclusions from reviewing bridge elements ranked as high priority (rank of 2), and whether maintenance they concluded needed to be done, was done in the recommended timelines.
- Senior management does not receive good summary information on the results of inspections, their impact on required maintenance, and confirmation that required maintenance has been carried out.
- In each of the last three years, regions did not spend 15 per cent of their maintenance budgets, despite having a list of necessary maintenance work.

For the level 1 inspections completed in the year ended March 31, 2011, we selected all inspections where bridge components had been rated 1 and checked whether the Department had repaired all components rated 1 immediately, and found that it had.

For bridge elements ranked as 2, inspectors' maintenance recommendations complied with the Department's guidance; they varied from replace to reduce the inspection cycle. A recommendation to repair the bridge element did not automatically result in the work being done within the guideline of six months. Instead, regional bridge staff did their own assessment, of the bridge component rated 2 and the bridge, and decided if repairs or other actions were needed. If their assessment of the inspection results was that maintenance didn't need to be done, the only support for their conclusions might be in the individual bridge file. The regions did not track how they had dealt with all maintenance recommendations ranked 2; they tracked the maintenance they planned to do. Bridge staff at both the head office and the regional offices confirmed that responsibility for maintenance lies with the regions. Head office does not require regional offices to report their maintenance activities, so does not have assurance that appropriate action was taken.

For level 2 ultrasonic testing inspections completed in the year ended March 31, 2011, we selected all inspections where the Department's Class A inspector strongly recommended maintenance work to the regions. We found that regional staff reviewed the recommendations and either completed the maintenance or could support their reasons for not doing the work. The Department does not require regional staff to report the action they took in response to head office staff's recommendations.

Of the \$15 million budgeted for routine maintenance, the regions spent about \$12.6 million in each of 2010 and 2011. They left about \$2.4 million unspent in 2010 and 2011, or about 16 per cent of total funding. This is despite all regions having lists of needed maintenance.

Implications and risks if recommendation not implemented

This increases the risk that deficiencies that affect safety will be missed or repairs necessary to protect the investment will not be done.

Capital planning

Background

The Department is responsible for identifying its capital needs. The Department of Treasury Board and Finance is the capital-planning department. It establishes capital plan requirements, oversees the process where all departments review individual departments' top five requests to ensure that the highest priority projects are considered for funding, and prepares and presents the capital plan recommendations to the Treasury Board Committee that advises the Treasury Board.

The Department of Treasury Board and Finance established criteria for ranking the top five requests, including the health and safety risk, impact on service delivery and physical condition. Each department ranked its own projects out of a possible 150 points.

For the 2012–2017 Capital Plan submission, departments were asked to include:

- their top five requests, over the next three to five years
- 10-year capital requirements
- Updates to the 2011–2016 capital maintenance requests
- total deferred maintenance, as of March 31, 2011

Departments could submit individual projects or bundle projects together if the bundle was more cost effective than individual projects, or if the bundle was clearly defined and of a manageable size to be in the three-year timeframe for priority projects. If a department bundled projects, it was required to provide similar information for each project in the bundle that it would have provided for a single project: the location, constituency and cost data, and score (out of 150 points).

Transportation's tools to plan for future capital needs

The Department developed a tool, called the Bridge Expert Analysis and Decision Support System (BEADS), which it uses to calculate the optimal time to replace each bridge. The input to the BEADS tool is information such as age and what the bridge components are made of, and the most recent level 1 inspection results. The tool estimates the deterioration rate for each bridge component, based on its condition when the inspection was done. It then calculates the best time to rehabilitate or replace the bridge.

The regional bridge staff and the head office staff review the results and incorporate other relevant information, such as planned work on the road that would impact when the bridge work should be done.

Recommendation: Capital planning

9 RECOMMENDATION

We recommend that the Department of Transportation ensure that it gives decision makers the information they need to assess the impact of funding alternatives on bridge safety and protection of the Province's investment.

Criteria: the standards for our audit

The Department should have effective processes to determine:

- the optimal time to rehabilitate or replace bridges
- the impact of various funding levels on the overall physical condition and safety of its bridges
- its deferred maintenance and the impact of deferral on the safety and condition of bridges

The Department should submit its capital plan to meet the Department of Treasury Board and Finance's requirements.

Our audit findings

Key findings

- The Department's process to develop the Capital Plan submission was well-designed, therefore it was able to produce good information for the submission. However, it did not fully follow the prescribed format.
- The Department did not provide sufficient information to the Department of Treasury Board and Finance to allow decision makers to better understand the risks of different funding levels on safety, service levels and future funding needs.

The Department's process to develop its Capital Plan submission was well designed. The Department used its BEADS tool to calculate the optimal time to rehabilitate or replace each bridge. The assumptions regarding the deterioration rates of bridge components were reasonable. However, the Department had not checked how accurate the estimated replacement dates were by comparing them to engineering studies. To compensate, Department bridge staff reviewed of the output and modified the estimates with the results of engineering studies or other pertinent information.

The Department confirmed that the condition ratings based on the level 1 inspections could be conservative, because a bridge component cannot be rated any higher than the worst element comprising the component. However, the Department did not rely solely on the level 1 inspection reports, since bridge staff that developed the capital plan also had the level 2 inspection results and engineering studies to support their ranking of projects.

The final product of this process was a listing of the optimal year to rehabilitate or replace each bridge. The Department used this listing to compile its 2012–2017 capital plan submission. We are satisfied with the reasonableness of this process.

We examined the Department's 2012–2017 Capital Plan submission. The Department did not fully comply with the Capital Plan submission requirements. For example, it did not provide information that would allow decision makers to differentiate the condition and cost of the projects within the large bundle.

Instead, the Department used the listing of the optimal replacement year and the cost of replacing each bridge structure. The Department submitted:

- as its first priority, a bundle of bridge structures, with an individual cost of more than \$2.5 million. These projects numbered about 100 and totalled \$900 million over 10 years.
- for capital maintenance funding, bridge structures with an individual cost of less than \$2.5 million. These projects totalled about \$350 million over 10 years.

For the \$900 million bridge bundle, the Department also submitted how it identifies bridge needs and a copy of its bridge management strategy guidelines.³ The Department quantified the percentage of older bridges and explained that many were at or near the end of their useful life. The Department said that bridges at the end of their useful life require extensive rehabilitation work to extend the life a few years. After that, if not replaced, they would be unsafe and the Department would have to close them. The Department said that 45 per cent of bridges were older than 40 years, with 20 per cent older than 50 years.

We understand that the Department of Treasury Board and Finance ultimately found the Capital Plan submission to be sufficient for its needs, as it believes it adequately pointed out immediate critical needs. However, we believe further information on the condition of projects within the large bundle would allow the Department of Treasury Board and Finance staff, and ultimately decision makers, to better understand the impact of different funding levels on risks to safety, service levels and future funding needs.

³ *Bridge Management Strategy Guideline* (version 1.0 – March 2008). www.transportation.alberta.ca/content/doctype30/production/bgmtstrgyg.pdf

We reviewed the age and condition of each bridge structure in the Department's capital plan submission and found that seven major bridges, seven standard bridges and 65 culverts were over 50 years old and had condition ratings lower than 35 out of 100. The Department estimated that bridges of this era typically have useful lives of about 50 years.

We have an outstanding recommendation to the Department of Treasury Board on information to decision makers (*October 2010 Report*). Some of the factors that the Department of Treasury Board and Finance will need to consider are:

- the impact—on service quality and overall costs—of deferring maintenance
- the impact of different funding levels on safety and use of infrastructure.

The Department's systems would let it provide much of this information to the Department of Treasury Board and Finance.

Implications and risks if recommendation not implemented

The Department risks not giving decision makers the information they need to assess the Department's capital needs.