

Total Maintenance Contracts

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The Texas Department of Transportation (TxDOT) began contracting maintenance in the mid-1970s with a few roadside mowing contracts. Contracting continued to increase through the 1980s with many activities contracted, such as picnic and rest area maintenance, guardrails, raised pavement marking, striping, and other mostly non-pavement-related activities. A dedicated program for preventive maintenance was created in 1986 with \$145 million for contracted seal coats and light overlays. The Texas legislature emphasized the contracting of TxDOT's maintenance by attaching a rider to the department's appropriation bill in 1989, which required TxDOT to contract a minimum of 25 percent of routine maintenance if cost-effective. In 1991, the Texas legislature passed a bill that required TxDOT to increase maintenance contracting to 50 percent by 1996. This also was contingent on cost-effectiveness. It included routine and preventive maintenance. In July 1999, TxDOT let two total maintenance contracts. The philosophy of a total maintenance contract is totally different from that of a regular maintenance contract. It is more of a management contract whereby the contractor is required to maintain a prescribed level of service for a lump sum bid. The contractor has total control to determine what work to perform, what materials to use, methods, schedule, and so forth. The history and evolution of maintenance contracting in Texas and the letting and results to date of the total maintenance contract are discussed. The specification and the condition assessment process that is being performed in conjunction with the projects are also discussed.

The Texas Department of Transportation (TxDOT) began contracting a part of roadside mowing operations in the mid-1970s. A reduction in force after most of the interstate highway construction was complete emphasized the need to contract to maintain the high level of service citizens of Texas had come to expect.

The first contracts were for mowing. It was thought that this would be a cost-effective activity to contract because it was a seasonal activity with most of the work being performed between April 15 and October 15. It also required a large investment in equipment and was very labor intensive.

By contracting mowing, the department could reduce the number of maintenance forces and reduce expensive equipment inventory. Also, it was believed that developing a contracting industry would be relatively easy because local farmers could use their tractors and mowers to do the work.

Contracts were originally small, usually two to four contracts per county. This allowed many different contractors to bid on the multitude of projects. This was very effective and resulted in good competition, low prices, and the development of many contractors. The department continues to contract over 90 percent of mowing and usually mows only in spot locations or when a contractor defaults.

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In the past few years almost every maintenance function has been contracted to some extent.

LEGISLATIVE DIRECTION

The Texas legislature emphasized the contracting of TxDOT's maintenance by attaching a rider to the department's appropriation bill in 1989. Rider 28 required TxDOT to contract a minimum of 25 percent of routine maintenance if cost-effective.

Although the department was already contracting almost 25 percent of its routine maintenance operations, the legislative interest emphasized the need to continue development of the maintenance contracting process.

In 1991, the Texas legislature passed a bill that required TxDOT to increase maintenance contracting to 50 percent by 1996. This also was contingent on cost-effectiveness. This legislation again emphasized the need for continued increases in the contract area. Even though the legislation allowed the inclusion of preventive maintenance contracts into the contracting percentage, the maintenance division had to establish contracting targets for each of the 25 districts to ensure the 50 percent requirement was met by 1996.

The department has continued to increase contracting and currently contracts about 55 percent of the total maintenance effort.

TOTAL MAINTENANCE CONTRACT

For over 20 years TxDOT had contracted single maintenance activities. In the mid-1990s the Houston district let several large multi-item contracts. Most maintenance activities on specific roadways were performed in a single contract. Although these contracts were for most of the maintenance effort on a number of highways, they were bid item contracts, where TxDOT inspected each activity, measured pay quantities, and paid for the quantities of work performed. TxDOT continued to operate the highways and was responsible for responding to public inquiries, permitting, and so forth.

Several times in 1997 and 1998 TxDOT looked into the possibility of letting a total maintenance contract. It did not appear to be cost-effective and the idea was rejected. Finally, in late 1998, a decision was made by the Texas Transportation Commission to try a pilot project.

The philosophy of a total maintenance contract is totally different from that of a regular maintenance contract. It is more of a management contract whereby the contractor is required to maintain a prescribed level of service for a lump sum bid. The contractor in effect takes over operation of the highways and has authority to make all decisions about the maintenance and operation of the highway. Contractors determine what work to perform and what materials and methods to use. They

plan and schedule work, subcontract for work, and have the authority to utilize experimental materials, file claims to collect for third party damages, and so forth.

CONTRACT DEVELOPMENT

In 1999, for the first time in its history, TxDOT awarded two contracts for the total maintenance and operation of two sections of the state's Interstate highways.

These two contracts involve an unprecedented level of risk for the department and for the contractor. First, two of the most heavily trafficked sections of Interstate highways in Texas are involved—193 km (120 mi) of IH-35 in the Waco District and 96.5 km (60 mi) of IH-20 in the Dallas District. Second, this is the first time this type of contract has been used by TxDOT and, to the author's knowledge, the first time it has been awarded by a low-bid process anywhere in the United States.

The total maintenance concept emerged from the annual Texas Quality Initiative conference held in Fort Worth in February 1998. A conference breakout session received an informational briefing of the newly initiated total maintenance program in Virginia. Although initial reaction within the department to this type of contract was very negative, fears have been calmed by communication, education, and the professionalism and competence of the contractor.

The development of the specifications was a genuine collaborative effort involving the department and a number of interested potential bidders. Both maintenance projects were formally "kicked off" with major partnering sessions where the principal partners, the interested communities, and other stakeholders were represented.

MEASUREMENT OF QUALITY

Previous maintenance contracts used in Texas required the contractor to meet a certain quality of work by specifying the materials and methods that were to be used. The total-maintenance-and-operation concept is different in that the outcome is specified and the contractor is expected to maintain the project to that specified level of service.

Performance standards were developed that defined the minimum level of service acceptable. These performance standards are minimum performance and quality measures for every element of work normally performed in the maintenance and operation of an Interstate highway system. They include all aspects of routine and preventive maintenance on the pavements, bridges, roadsides, traffic operations, and traffic services. They also include incident response, hazardous materials cleanup, and emergency repairs. Contractors are responsible for coordination with local governmental entities and law enforcement. They are responsible for processing damage claims and reimbursement from federal agencies in the case of a disaster.

Although TxDOT established levels-of-service guidelines about 10 years ago, they were very generic and were not detailed enough to use as performance standards. Developing the performance standards was the most difficult part of the specification and involved the largest number of people.

The team decided it was critical to develop a method to compare the quality before and after. Because TxDOT had not previously measured maintenance condition, a system had to be developed to measure the existing and resulting level of service. The result was the development of the Texas Maintenance Assessment Program (TxMAP).

TxMAP involves measuring the level of service on maintenance elements in four maintenance components: pavement, bridges, traffic services, and roadside. Random 1.6-km (1-mi) sections are rated every 16 km (10 mi). Bridges are rated in a separate evaluation. Each element (for example, rutting, failures, striping, signing, mowing, litter) is rated at each location, on a scale of 5 to 1, where 5 is excellent—new or like new; 4 is good—no work needed; 3 is fair—minimum acceptable condition; 2 is poor—needs work; and 1 is failed. A 1 to 100 score is determined for each element by taking the actual score and dividing by the maximum. Each element is given a priority multiplier depending on its relative importance based on the following maintenance priorities: safety, protect the investment, user comfort, and esthetics. The elements are then combined by multiplying the element score by the priority rating, summing all the resulting scores in each component, and dividing by the maximum possible score. The result is a 1 to 100 score for each component. The components are combined to give an overall score. This process is very similar to that described in *NCHRP Web Document 8 (1)*.

TxDOT's administration was so impressed with the TxMAP assessment process that they requested an evaluation of the whole Interstate system. This evaluation was performed from July through October 1999 and will be repeated this year.

Although a formal evaluation of the total maintenance contract has not been done, no complaints have been made by the traveling public, local municipal entities, or law enforcement officers about the level of service provided by the contractor. Comments have been made by TxDOT employees, who were impressed with the innovations the contractor used.

ISSUES ADDRESSED

Because this is a relatively new concept in contracting for highway maintenance, many risks were involved. The maintenance division was very careful to get all affected parties involved as soon as possible. Good, open communication was believed to be the key in calming the fears of departmental employees and contractors about this type of contract.

Another big concern was cost. Lack of competition could result in increased cost of getting the work performed or in a deterioration in the level of service provided to the public. TxDOT has used a combined effort of state forces and small maintenance contracts to effectively maintain the highways. Initially, the team thought a contractor for the total maintenance and operation of these facilities could not compete and that costs would increase substantially. This was proved not true, as the successful contractor bid lower than anticipated.

One of the department's most critical functions is to respond to emergencies. This may include repairing damaged highway facilities caused by accidents or natural disasters, removing debris or hazardous materials, or assisting law enforcement officials with traffic control after an incident. The team was extremely concerned about the ability of the contractor to perform in emergency situations. Special emphasis was placed on performance standards to ensure an acceptable response would be provided in this area.

Another big concern was the effect on the morale of TxDOT maintenance forces. TxDOT employees are very proud of the quality highway system they have constructed, maintained, and operated over the past 83 years. Many maintenance employees have long histories with the department that may date back to their parents or grandparents. They intimately know the highways in their sections, where they have bladed snow, patched potholes, picked up dead animals, and, most importantly, assisted stranded motorists or helped out in accidents. No employees were displaced and no offices were closed. Total contracting of all maintenance on the Interstate system in these districts allows existing employees to be used on non-Interstate highways in the counties involved.

The failure of the contractor to respond could also damage the good working relationship that exists between the department and local entities. Another possible risk is objections by the traveling public or property owners. Other concerns were the political pressure to perform more of this type of contract or just the opposite, objections from contracting organizations and small or minority contractors.

In fact, a number of concerns were expressed by the contracting community that they could not bid this type of project. Because there were no quantities of work, they thought the risk was too great and they did not know how to bid the project. In reality, the contractor has subcontracted much of the work to the same contractors.

INVOLVEMENT OF INDUSTRY

The initial consideration of this type of project was discussed at the Texas Quality Initiative Conference held in Ft. Worth Texas in February 1998. A large group of people including TxDOT maintenance and construction

engineers, construction and maintenance contractors, and material suppliers discussed this type of approach to contracting maintenance.

A number of contracting entities solicited consideration of a total maintenance contract from the department's administration. After discussion of a total maintenance contract was begun in TxDOT, meetings were held and input was received from Infrastructure Corporation of America (ICA), Nashville, Tennessee; Virginia Maintenance System (VMS), Richmond, Virginia; PBS&J, Dallas, Texas; and Roy Jorgensen Associates, Buckeystown, Maryland.

In any contract, the specification(s) is the most important controlling document in the contract. A large number of people were involved in developing the specification for this project. This specification was different from any other TxDOT specification because it is based on performance instead of methods and materials. The districts letting the contracts, Dallas and Waco, were the most intimately involved in the performance standards in the contract. The TxDOT Maintenance Division took the lead and, once a draft was prepared, solicited review and input from the TxDOT Maintenance Specification Committee, interested contractors and consultants, TxDOT's Public Affairs Office, TxDOT's Internal Review Office, the Texas Associated General Contractors, the Texas Attorney General's Office, and FHWA.

Because this was a new type of project, another way the team got input from the stakeholders was to hold a prebid meeting. Notices were sent to all contractors on the TxDOT bidders list and it was advertised in the paper. The meeting room was filled with contractors, consultants, suppliers, local governmental officials, and TxDOT employees. There were a number of issues discussed with mixed opinion from the affected parties. Several contractors expressed their concern about the lack of bid items and their ability to prepare a reasonable bid. The specification and bid documents were thoroughly discussed and questions were answered.

A partnering meeting was held with the contractor for each contract. Involved in the partnering session were TxDOT employees, the contractor (VMS), and officials from a number of local cities. All the affected players met, discussed, and resolved issues before the projects began. An important part of the partnering meeting was establishment of the appropriate team members and the issue escalation process.

**SPECIFICATION SUMMARY:
SPECIAL SPECIFICATION—TOTAL
MAINTENANCE AND OPERATION OF HIGHWAYS**

Note: This is a summary of the specification used, not the complete specification.

1. Description. This item shall govern for the complete maintenance and operation of highways including all its existing appurtenances and future additions. This includes main-lane roadways, frontage roads, shoulders, ramps, intersections, roadsides, bridges, rest areas, picnic areas, traffic operations, and so forth.

2. General. It is the intent of this specification that the contractor shall relieve the state of all duties traditionally performed by the state in maintaining and operating the highways. It is anticipated that no change orders, except for contract extension, changes in governmental policy, or changes in state or federal statutes, will be executed during the course of this contract.

2.1. Department Standards. Unless otherwise approved by the engineer, work performed and materials used under this contract shall conform to the latest version of all department manuals, standards, specifications, statewide special specifications, policies and procedures, and their addendum.

2.2. Coordination. In performing work under this contract, the contractor shall ensure that proper coordination exists with cities, counties, state and local law enforcement, utilities, fire departments, and other state and federal agencies.

2.3. Purchasing from People with Disabilities. The contractor shall comply with the provisions of Chapter 122 of the Texas Human Resources Code that are placed on the department.

2.4. Existing Contracts. Several TxDOT contracts with community rehabilitation programs will be in effect at the beginning of this contract.

2.5. Reporting. The contractor is required to have a personal computer that is capable of connecting to the department's information systems and will report to the department the following information:

- Work accomplished: Using the department's construction and maintenance contract system, the contractor shall report to the department work accomplished and unit cost.

- Highway condition report: By 8:10 a.m. each work-day and as changes occur, the contractor shall report weather conditions and any lane closures using the department's highway condition reporting system.

- Condition assessments: The contractor will be required to perform monthly condition assessments of all elements of the highway and rights-of-way. These assessments shall be reported to the department each month.

- Complaints/service requests: The contractor shall report no later than the 15th of each month, in a format approved by the department, information on any complaints or service requests received from the public, prop-

erty owners, cities, counties, legislators, and so forth from the previous month.

- **Accidents/incidents:** The contractor shall report, no later than the 15th of each month in a format approved by the department, information from the previous month on any accident or incident related to work being performed by the contractor.

- **Agreements:** The contractor shall provide the department with copies of all agreements between the contractor and counties, cities, municipalities, sheltered workshops, prisons, and so forth that are associated with the work on this contract.

2.6. **Traffic Signals and Illumination.** The contractor will provide maintenance and operations (including utility costs) of various traffic signals and illumination as outlined in the general notes and specification data sheet(s).

3. **Materials.** The contractor will furnish all materials necessary to complete this work. The contractor shall furnish the engineer with documentation indicating material compliance with department specifications unless otherwise approved by the engineer.

4. **Equipment.** The contractor shall be responsible for furnishing all equipment, tools, and machinery necessary for the proper prosecution of the work.

5. **Scope of Work.** Excluding only those items of work listed in Subarticle 5.1, it is the responsibility of the contractor to perform all work required to maintain and operate the highway and its appurtenances. The contractor should be aware that this work also includes items such as catastrophic repair, hazardous material cleanup, and disposal.

The contractor shall pursue claims against third parties for damage caused to the highway or its appurtenances. The contractor shall also prepare the documentation in the required format to apply for emergency relief funds (ER) from the FHWA in the event of a presidential disaster declaration. The funds acquired by the department as a result of these claims or ER projects shall be added to the contractor's monthly payment in the month the funds are received.

Funds to repair major damage caused by catastrophic events not reimbursed by FHWA or third parties will be added to the contractor's monthly payment after the work is completed. The damage shall be of the extent that it is above and beyond normal routine or preventive maintenance and shall be a minimum of \$50,000.

5.1. **Items Excluded from the Contract.** The contractor will not be responsible for the following items only:

- Courtesy patrols;
- Traffic management devices (such as cameras, changeable message signs, automatic vehicle identification

readers/antenna, amplifier cabinets, detectors including acoustic, vehicle imaging vehicle detection, microwave);

- Agreements such as utility permits, driveway permits, multiple use agreements, construction and maintenance agreements, and other similar agreements; and
- Logo signing.

5.2. **Traffic Control Plans.** The contractor must perform all work in conformance with the *Texas Manual on Uniform Traffic Control Devices for Streets and Highways* (2) and the barricade and construction standards.

5.4. **Public Notification.** The contractor shall furnish and install signs notifying the public that the highway is under private maintenance and operation. Any information provided to the press shall be routed through the department's public information officer in the district for release.

5.5. **Performance Standards.** Listed below are performance standards, which shall be used by the contractor to schedule work. The safety of the traveling public is of utmost importance and shall take priority over any other work. Safety-related work shall be scheduled as soon as possible.

Note: Because of space limitations, only the elements with a few example performance standards are listed.

Pavement maintenance

Asphalt surfaces (travel lanes and/or shoulders)

- No ruts > 1.27 cm (0.5 in.).
- No unsealed cracks > 0.635 cm (0.25 in.).
- Patching, even and <0.635 cm (0.25 in.) high or low.
- Ride should be smooth with no discernible dip or hump and have a score of 3.5 or above on the Mays meter.
- Potholes will be repaired immediately.
- Base failures shall be repaired immediately.
- No edge dropoff > 5.08 cm (2 in.) and > 15.24 m (50 ft) long.
- No flushing allowed.

Concrete pavement (travel lanes and/or shoulders)

Roadside maintenance

Bridge maintenance

- Overall bridge
- Railing
- Deck
- Superstructures
- Substructure
- Channels
- Embankments

Traffic operations

6. Contractor Performance. If in the opinion of the engineer the contractor is not performing work according to this contract, the department may take steps to have the work corrected. This may include the use of emergency contracts. The costs associated with these measures will be deducted from any payments due the contractor. In addition, liquidated damages in the amount of \$5,000 per working day, during the work correction period, will be deducted from the amount due the contractor.

7. Termination. This is an experimental project. If both parties to the contract agree in writing to terminate the contract, the department shall prepare a termination agreement, and the contract shall end 30 days after the date of the last signature.

8. Measurement. This item will be measured by the lump sum, as the work progresses.

9. Payment. The work performed in accordance with this item and measured as provided under "Measurement" will be paid for in partial payments in accordance with the schedule, utilizing the unit price bid for total maintenance and operation of highways (Table 1). This price shall be full compensation for this work and for furnishing all labor, equipment, materials, fuel, tools, and incidentals necessary to complete the work for a 5-year period beginning on the date of the original work order.

Should a construction or reconstruction project(s) occur involving portions of highway covered by this contract, the contractor may be relieved of items of work covered by the construction contract along those portions of highway for the duration of the construction project. Monthly payments to the contractor will be reduced by an amount agreed upon by the department and the contractor.

Monthly payments shall be made by multiplying the lump sum bid by the payment schedule percentage and deducting any amounts as indicated under contractor performance.

10. Contract Extension. If agreed to in writing by both parties to the contract, the contract may be extended an additional 36 months in accordance with the payment schedule (Table 2). Either party to this contract may request a revised pay schedule for the contract

TABLE 1 Contract Payment Schedule

| Year | Monthly Payment Schedule (Percent) | Cumulative Payment (Percent) | Cumulative Time (Percent) |
|------|------------------------------------|------------------------------|---------------------------|
| 1 | 1.850 | 22.200 | 20.000 |
| 2 | 1.500 | 40.200 | 40.000 |
| 3 | 1.530 | 58.560 | 60.000 |
| 4 | 1.561 | 77.287 | 80.000 |
| 5 | 1.893 | 100.000 | 100.000 |

TABLE 2 Contract Extension Payment Schedule

| Year | Monthly Payment Schedule (Percent) | Cumulative Payment (Percent) | Cumulative Time (Percent) |
|------|------------------------------------|------------------------------|---------------------------|
| 6 | 1.750 | 121.000 | 120.000 |
| 7 | 1.785 | 142.420 | 140.000 |
| 8 | 1.821 | 164.268 | 160.000 |

extension and, if executed by change order, will replace the following.

Monthly payments shall be made by multiplying the original lump sum bid by the payment schedule percentage and deducting any amounts as indicated above under contractor performance.

SHORT- AND LONG-RANGE IMPACT

TxDOT ventured into this type of contract to develop another tool in performing needed maintenance with limited resources. The initial reaction to this type of contract by TxDOT managers and employees was very negative. Concern was expressed about the impact on the morale of maintenance employees, the reaction from the public, the ability of the contractor to respond in emergency situations, and the anticipated higher cost.

Fears have been calmed by the communication, education, professionalism, and competence exhibited by the low-bid contractor. Generally, the bid was substantially lower than expected. Some unanticipated benefits that have the potential to influence the organization are some of the innovative approaches of the contractor. For instance, to respond to a snow-and-ice event, the contractor arranged for local agricultural fertilizer companies to use their equipment to distribute aggregate and deicing chemicals on the roadway. Not only was this equipment readily available, because of the bad weather and time of year, but it proved to be very effective in regulating the quantity of material placed. The contractor has also used some experimental materials with good success.

There was also concern expressed by small businesses about their inability to bid on the maintenance work. However, the contractor has subcontracted a large amount of the work to the same contractors who were doing the work previously.

The partnering sessions resulted in a good start for the contracts by opening lines of communication and introducing the stakeholders from all parties.

The long-range impact on TxDOT will be the development of an additional tool in the goal of maintaining the highway system.

COST AND TIME SAVINGS

Although TxDOT anticipated the cost of these projects would be higher than previous costs, the bids came in lower than expected. These contracts are very early in their life and the true cost cannot be determined until levels of service can be evaluated. The condition of the sections at the end of the contract period will play an important part in determining the cost-effectiveness of the contract.

There are a number of less tangible advantages to this type of contract from the management perspective. Less inspection is required because of a single contractor versus multiple contractors. Less documentation of quantities performed is required because of the lump sum payment method versus individual items of work.

Also department forces can utilize innovations, effective methods, and new equipment developed by the contractor. The contractor may be innovative in the use of alternative or experimental materials, which may prove their benefits for further use by the department.

CONCLUSION

The development of this type of contract provides another tool for transportation engineers in maintaining the highway system. It may result in cost savings to the agency and may provide the development of innovative methods, materials, or processes.

REFERENCES

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2. Traffic Operations Division, Texas Department of Transportation. *Texas Manual on Uniform Traffic Control Devices for Streets and Highways*. Texas Department of Transportation, Austin, Tex., Jan 1, 1999.