Office of Construction and Innovative Contracting

INNOVATIVE CONTRACTING IN MINNESOTA

2000 TO 2005

A+B Bidding
Incentives
Lane Rentals
Pay for Performance
Warranties
Pre-Cast Pavement Panels
Pre-Cast Bridges

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For more information on Innovative Contracting in Minnesota, please refer to the following website:

http://www.dot.state.mn.us/const/tools/innovativecontract.html

Innovative Contracting Executive Summary

Since 2000, innovative contracting techniques have been implemented on a variety of roadway construction projects throughout the state. This report details the results of the A+B, Lane Rental, Incentives/Liquidated Savings, Pay for Performance, Warranties and new pre-cast concrete products applications that were constructed (or are currently being constructed) during this timeframe.

Innovative contracting techniques have been effective in reducing construction time and impacts to motorists with A+B bidding, lane rentals and incentives, and improving quality through Pay for Performance measures and warranties.

A+B Bidding

To date, 15 projects have used A+B bidding. The projects ranged from small pavement rehabilitation projects to major reconstruction and expansion projects. The size of the projects ranged from $600,000 to $15.6 million, with a total let amount of $93.8 for the 15 projects. Approximately $671,300 has been paid in incentives.

Conclusions:

- A+B has been an effective tool for reducing contract time. Contractors are bidding (on average) 15% fewer days compared to the maximum allotted time by Mn/DOT.
- The use of incentives has been an effective method for further reducing contract time. On average, a contractor completes the project 17% faster than the original bid time if an incentive is included in the contract. This compares to 6% for non-incentive contracts.
- A+B bidding does not appear to greatly increase the bid cost of the project. On eleven of the fifteen projects, the low bid was under the engineer's estimate. The other four projects were 1, 3, 5 and 8% over the Engineer's Estimate.
- Contractors are using additional crews, longer hours and resources to complete the work faster than normal projects. This pace has strained Mn/DOT staffing and fatigued contractor staff, which has the potential to decrease quality and jeopardize safety.
- It appears that this method of bidding is requiring the contractor to look more closely at the constructability of the project during the bidding process.
- The 'B' portion of the process has not changed the bid outcome, meaning the contractor with the lowest 'A" portion has been awarded the bid even if he did not have the lowest number of bid days.

Recommendations:

- Develop more guidelines to help project engineers determine if A+B bidding is appropriate for their projects.
- Provide state-wide training on A+B projects to construction and design engineers.
- Examine the existing contract administration methods to make sure they can be applied to A+B projects.

Incentives/Liquidated Savings

To expedite construction timelines, Mn/DOT has offered incentives and liquidated savings on several projects throughout the state. Mn/DOT has recently incorporated the use of incentive/disincentives on five roadway and bridge projects. Two projects offered liquidated savings, a concept in which the contractor can obtain an incentive equal to the amount of Mn/DOT's contract administration fees for early completion.

Conclusions

- On projects with incentives (except those with liquidated savings), the contractor used extra effort to complete the project early in order to obtain the bonus.
- There is currently not enough data to determine if contractors are adjusting their bids in anticipation of obtaining the bonus to offset costs.
- On projects with incentives, the contractor used aggressive schedules that placed some strains on Mn/DOT oversight staff.
- Contractors did not appear to expedite construction times when liquidated savings was offered as a bonus.

Recommendations

- Continue to promote the use of incentives on projects and encourage districts to cap incentives.
- Develop guidelines on appropriate incentive amounts and special provisions.
- Continue to encourage the liquidated savings concept statewide and on a variety of project types. Contractors in other districts may see liquidated savings as a significant incentive to reduce contract time.

Lane Rentals

The lane rental concept is used to encourage contractors to minimize road-user impacts. The contractor is required to pay a rental fee for closing lanes or shoulders during construction. If a contractor exceeds the proposed time within their bid, they are assessed a penalty in the amount of the rental fee rate. Often, the contractor is awarded an incentive for any un-used hours of their bid. The lane rental concept has been applied to six (6) projects since 2000.

Conclusions

- Lane rental is an effective tool to reduce the amount of lane closures on projects.
- Without good specifications and enforcement, the use of lane closures may decrease safety.
- Awarding incentives for early completion also helped reduce lane closure impacts.
- Some field personnel believe that lane rentals may also decrease quality of work. Contractors will work more night hours when lane rental times are typically lower.

Recommendations

- Develop guidelines for using lane rentals on Mn/DOT and local projects.
- Continue to monitor lane rental use on Mn/DOT projects.

Pay for Performance

Pay for Performance is used measure the final performance of an item compared to performance criteria established in the contract. Unlike traditional specifications where the owner assumes the risk if the contractor is in compliance with the specification but the final outcome is not acceptable, Pay for Performance requires the contractor to correct any deficiencies.

Conclusions

- Pay for Performance may be an effective tool to improve quality, but there is not enough data at this time to evaluate it's effectiveness.

Recommendations

- Monitor the Pay for Performance pavement marking items on the I-494 Projects
- Identify additional items and projects where Pay for Performance can be used.

Warranties

The goal of instituting warranties on projects is to improve the quality and durability of products by allowing a longer timeframe to accept work constructed by contractors. This process is also aimed to encourage contractors to improve their construction techniques and use better equipment to meet the warranty requirements. With warranties, there is potential to decrease the level of inspection required by Mn/DOT.

Bituminous and grading warranties have been applied to 11 design-bid-build projects. More comprehensive warranties have been applied to all the design-build projects.

Conclusions

- Except for two projects (both design-build and design-bid-build), projects with warranties have not experienced any significant issues since construction.
- No significant changes to the bituminous construction practices were identified by field personnel on projects with two-year warranties.
- There are no trends to suggest that contractors are bidding higher bituminous unit costs on warranty bid items compared to non-warranty bid items. Contractors are likely including potential corrective actions costs within the mobilization item.

Recommendations

- Continue to monitor the 2-5 year warranties on the design-build and design-bid-build projects currently in effect in Minnesota.
- Continue to monitor the effectiveness of short term (2-5 year) and long term (20-year) bituminous warranties in other states.
- Develop additional threshold and corrective action guidelines for implementation on future design-build and design-bid-build projects. The guidelines should also clearly define when the warranty period begins.
- Gather input from the industry on the use of warranties, including bonding and contractual issues.

Pre-Cast Components

The use of new and innovative pre-cast concrete components was implemented on several projects throughout the state. These new systems include pre-cast concrete pavement slabs on TH 62 in the Metro District and pre-cast concrete slab systems on bridges on TH 8 in Chisago County and on TH 72 over the Tamarac River in District 2. The intention of these new systems was to examine ways to reduce construction time and reduce delays to motorists during construction.

Conclusions

- Costs of pre-fabricated concrete pavement panels are substantially higher than standard DOT repairs, User-costs need to be carefully considered when selecting this type of rehabilitation strategy.
- The elimination of cure time can be significantly reduce lane closure time.
- It is possible that on smaller repair areas, a pre-cast repair could be made during the day or night, and re-opened to traffic before the next rush hour.
- Pre-cast concrete bridge slab systems have the potential to significantly reduce field construction time by eliminating the need for falsework.
- Environmental impacts can be reduced by minimizing stream/river impacts during construction.
- By casting the bridge slab systems in a controlled environment, the quality of construction should significantly increase.
- These systems are relatively expensive compared to standard construction practices due to the start-up costs for the pre-fabricators.

Recommendations

- Continue to monitor the long-rang durability of pre-cast concrete pavement panels and compare the durability to the typical repairs also performed on the TH 62 project.
- Educate designers and construction personnel on the successes and drawbacks of these pre-cast concrete product projects.
- Continue to work with Mn/DOT Bridge Section on the use of pre-cast bridge slab components and identify future projects for implementation.

Other Innovative Contracting Techniques

In addition to the techniques described above, Mn/DOT is continuing to assess new ways to improve quality, reduce construction time, and improve safety in our work zones. Our goal is to continue to work with the FHWA and other states on developing and assessing new innovative contracting techniques.

Mn/DOT will be hosting a National Highway Institute course on innovative contracting this winter. The goal of this course is to learn about other innovative contracting techniques available and learn about the benefits/drawbacks of these systems based on experiences in other states.

II. A+B Projects

Since 2000, several Mn/DOT district have used A+B bidding. In total, fifteen (15) projects have been let in five districts. Listed below is a summary of these projects and results observed throughout the state.

A. PURPOSE

The purpose of A+B projects is to reduce impacts to the public (road user costs) by selecting a contractor with the best combination of price and time. Each contractor submits a bid consisting of two components:

- "A" Component – Traditional bid for the contractor items and is the dollar amount for all work to be performed under the contract
- "B" Component – The contractors 'bid" of total number of calendar days required to complete the project

The "B" Component is multiplied by the road user cost furnished by the Mn/DOT and added to the "A" Component to obtain the total bid.

(A) + (B x Road User Cost/Day)

B. PROJECT TYPES

Projects selected for A+B bidding had major impacts to the traveling public. The majority of projects were pavement rehabilitation projects. Listed below are the projects that have used A+B bidding since 2000.

District	*SP*	*Hwy*	*Type*
3	1804-48	TH 169	Bit Mill and Surfacing, Culverts and Turn Lanes
3	1809-55	TH 371	Grading, Bituminous, Signing, Culverts and Bridges
4	6108-18	TH 55	Bit Reclamation, Milling, Surfacing, and Culverts
6	2480-81	TH 35	Unbonded Concrete Overlay & Bridge Rehab
6	2481-41	TH 90	Unbonded Concrete Overlay and Bridge
6	6680-96	I-35	Unbonded Concrete Overlay, Bridge and Lighting
6	2480-99	I-35	Unbonded Concrete Overlay and Bridges
7	0702-107	TH 14	Concrete Pavement, Lighting, Signals, Bridges
7	5380-0112	TH 90	Bit Mill and Overlay
7	1703-0064	TH 60	Mill and Overlay
7	5202-24	TH 14	Bit Mill and Overlay and Turn Lanes
7	5212-24	TH 169	Bit Mill and Overlay and Concrete Rehab
METRO	2738-20	TH 101/94	Deck Overlay, JT Repair and Guardrail
METRO	2780-0053	TH 94	Shld Replacement and Widening and Bridges
METRO	0209-22	TH 169	Urban Reconstruction

Table 1 – A+B Project Types

In district 4, the A+B concept was applied to a detour route on TH 55. This project required a 25 mile detour route which resulted in an additional 10 miles for motorists to reach their destination. The contractor bid the total number of days that TH 55 would be detoured.

C. AWARD OF CONTRACTS

On all fifteen (15) contracts, the contractor with the low bid 'A' Component was awarded all of the contracts. On five contracts, the contractor awarded the project also had the lowest bid number of days.

I-35 Unbonded Overlay – District 6

D. TIME IMPACT ANALYSIS

Mn/DOT specified in the special provisions the maximum number of days the contractor would be allowed to complete the work. It was anticipated that the contractors would bid less than this in order to obtain the bid. Listed below are some average statistics:

- 15% Time Savings – Low Bid days versus Mn/DOT max in the Special Provision.
- 11% **Additional** Time Savings – Actual construction time versus bid days + extensions
  - 17% Time Savings on projects with incentives
  - 6% Time Savings on projects without incentives

Note: The project involving the claim is not used in the analysis below due to complications with contract time involved with the claim.

On projects with incentives, contractors made additional efforts to complete the project earlier. Of the four projects without incentive, only two projects were completed before the bid days. The other two projects were completed within the maximum allotted time.

E. INCENTIVES AND DISINCENTIVES

Listed below are the average rates of incentives allowed and paid on the eight completed projects with incentives.

			Max Incentive		Paid Incentive	
District	**SP**	**Hwy**	**% of Bid**		**% of Bid**	**Amount**
3	1809-55	TH 371	1.6%	$ 250,000	1.6%	$ 250,000
4	6108-18	TH 55	2.8%	$ 100,000	1.9%	$ 70,000
6	2480-81	TH 35	0.2%	$ 25,000	0.2%	$ 25,000
7	5380-0112	TH 90	3.8%	$ 100,000	1.9%	$ 47,000
7	1703-0064	TH 60	2.9%	$ 70,000	2.9%	$ 70,000
7	5212-24	TH 169	Unlimited	Unlimited	0.5%	$ 9,300
METRO	2738-20	TH 101/94	8.3%	$ 50,000	8.3%	$ 50,000
METRO	2780-0053	TH 94	2.5%	$ 150,000	2.5%	$ 150,000
METRO	0209-22	TH 169	3.8%	$ 250,000	-0.3%	$ (20,000)
				Total Incentives Paid		**$ 671,300**
				Total Disincentives Paid		**$ (20,000)**

Table 2 – Incentive/Disincentive Summary on A+B Projects

The following bullets are general statistics regarding the use of incentives on A+B Projects.

- 10 of the 15 projects allowed for incentives.
- Incentives ranged from $3,100/Day to $10,000/Day

According to the FHWA Technical Advisory Report T 5080.10 (Incentive/Disincentive (I/D) For Early Completion), the maximum amount of incentive should not exceed 5% of the contract cost. The FHWA report also recommends that the cap be substantial enough to encourage the contractor to increase productivity to meet the project schedule.

All of the projects except 2738-20 had incentives within the FHWA guidelines. Project 2738-20 was a project with a relatively low dollar amount ($601,000), but had major traffic impacts. The project required reducing traffic on I-94 to a single lane over the Crow River where the AADT exceeded 70,000. In this case, increasing the maximum incentive above 5% was justified by the decrease in roadway user impacts.

F. COST ANALYSIS

This analysis compares the awarded bid versus the engineers estimates prepared at letting. The engineer's estimates did not account for any anticipated acceleration costs or incentive payments for these projects. The awarded bid shown is for the "A" Component only.

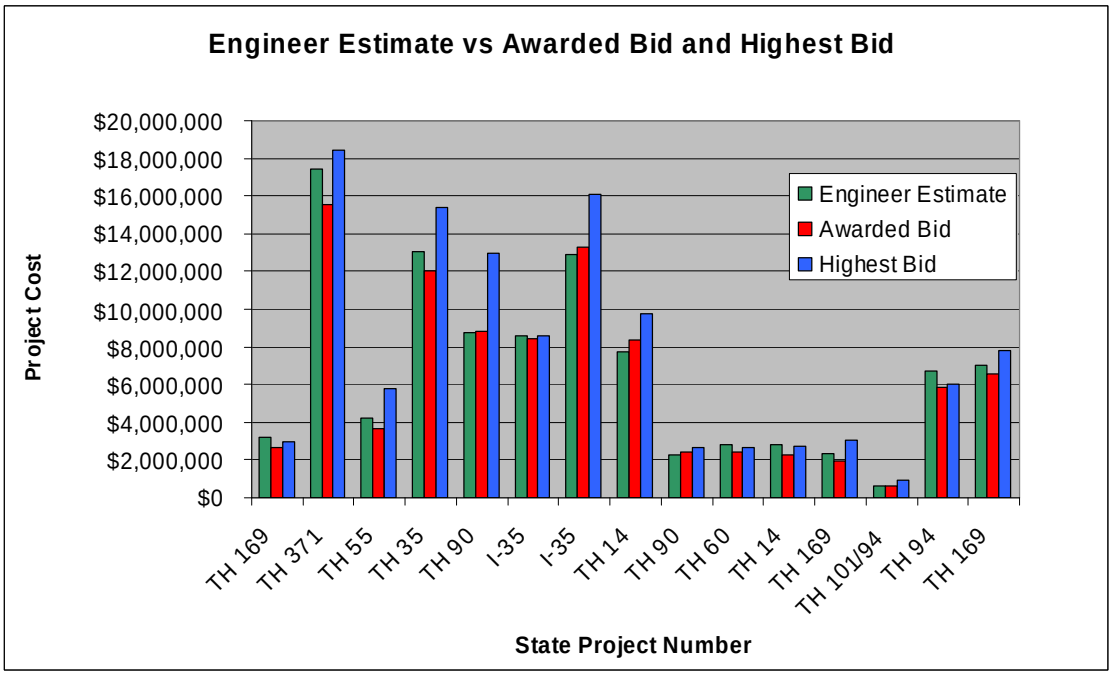

Table 3 – Engineer Estimate versus Awarded Amount on A+B Projects

The results of this analysis indicate that 'A" costs are not higher than typical projects. The trends indicate that the engineers estimate is falling between the low and high bids. It is possible that lower bid costs are occurring as a result of contractors spending more time looking at the project details during the bidding process.

G. CASE STUDIES (WHAT'S WORKING AND WHAT'S NOT WORKING)

TH 55 Detour (SP 6108-18)

District 4 applied the A+B Bid method to a project involving a lengthy detour. The project involved bituminous reclamation, milling, surfacing and culvert work on TH 55 between TH 28 and the Stearns/Pope County Line. The detour route for the project was approximately 25 miles in length and added approximately 10 miles to each trip.

Contractors were required to bid on the number of days that traffic would be on the detour route (with a maximum of 50 days). Three contractors bid 50 days and the low bid contractor bid 25 days. The detour portion of the project was completed in only 21 days, significantly reducing impacts to the traveling public.

Due to some overruns in subcut quantities, Mn/DOT extended the contract time to 35 days. The contractor received a bonus of $70,000 (14 days at $5,000/day) for early completion of this project.

TH 94, Crow River to I-494 (SP 2780-53)

In 2002, Mn/DOT let a project to widen shoulders and bridges on I-94 between I-494 and the Crow River. Mn/DOT required that the work be completed in no more than 138 days and included an incentive clause of $10,000/day with a maximum incentive of $150,000.

The three contractors bid 130 (low bid), 138, and 138 days. The bid time on this project was extended by two supplemental agreements due to added work and Mn/DOT caused delay due to poor subgrade (delayed bridge demo to assess durability of bypass):

In total, 17 days were added to the contract for a total time of 147 days. The contractor completed the work in 129 working days and received the maximum amount of incentive of $150,000.

This project is an example of how Mn/DOT caused delays extended the contract time, but still allowed the contractor to obtain a substantial incentive. Plan additions and unforeseen poor subgrade soils contributed to these delays.

H. LESSONS LEARNED

We contacted the resident or project engineer to obtain their perspective on how the A+B process impacted their project. Listed below are the lessons learned:

Applications of A+B

Overall, the resident engineers agreed that the A+B process is a great tool for using on projects with anticipated high road user delays. Many resident engineers felt that this process could be applied to a wide variety of projects and not necessarily rehabilitation projects.

Some resident engineers felt that A+B should not be used in the following areas:

- High potential for poor soil overruns
- Poor design plans where negotiating additional time may become an issue
- Utility conflicts or relocations may impact schedule
- Mn/DOT staffing limitations could jeopardize safety and quality of work

Contractors Approach

Most of the contractors approached the A+B projects with additional crews and longer hours in order to meet the completion deadlines and/or obtain the incentives.

Mn/DOT Staffing

In some cases, aggressive schedules often placed a heavy burden on Mn/DOT staffing during these projects. In some districts, the contractors' aggressive schedules placed a heavy burden on staff to keep up with the number of crews and long work hours.

Safety and Quality of Work

Some resident engineers felt that the aggressive schedule created long work hours that may have influenced the quality of work for both the contractor and Mn/DOT staff. The aggressive schedule and fatigue of crews may have compromised safety for both workers and motorists within the construction zone.

Incentives

- The resident engineers had mixed feelings regarding the use of incentives.
    - Contractors should already be bidding the minimum number of days, so why should the contractor receive an incentive.
    - Others felt that incentives were a benefit for even earlier completion.

I. CONCLUSIONS

- Resident Engineers felt that the A+B process was a good tool for projects with high anticipated roadway user cost delays.
- A+B bidding does not appear to greatly increase the bid cost of the project. The engineers estimate is generally falling between the low and high bids.
- A+B has been an effective tool for reducing contract time. Contractors are bidding on average 15% fewer days compared to the maximum allotted time by Mn/DOT.
- The use of incentives has been an effective method for further reducing contract time. On average, a contractor completes the project 17% faster than the original bid time if an incentive is included in the contract. This compares to 6% for non-incentive contracts.
- Contractors are using additional crews, longer hours and resources to complete the work faster than normal projects. This pace has strained Mn/DOT staffing and fatigued contractor staff, which has the potential to decrease quality and jeopardize safety.
- It appears that this method of bidding is forcing the contractor to look more closely at the constructability of the project during the bidding process.
- The 'B' portion of the process has not changed the bid outcome, meaning the contractor with the lowest 'A" portion has been awarded the bid even if he did not have the lowest number of bid days.

J. RECOMMENDATIONS / NEXT STEPS

- Develop Additional Guidelines on when and where to use A+B Bidding
- Provide Additional tools for the project engineer to learn more about A+B bidding
- Examine existing contract administration methods to make sure they can be applied to A+B Projects.

III. INCENTIVE PROJECTS

A. PURPOSE

To expedite construction timelines, Mn/DOT has offered incentives and liquidated savings on several projects throughout the state. Mn/DOT has recently incorporated the use of incentive/disincentives on several roadway projects to expedite construction timelines.

Two projects implemented Liquidated Savings, a concept in which the contractor can obtain an incentive equal to the amount of Mn/DOT's contract administration fees for early completion.

B. PROJECT TYPES

District	SP	Hwy	Letting	Construction Type	Incentive Type
2	6803-38	11	6/10/2005	Grading, Bit Surfacing, Storm Sewer, Signals	Daily Incentive
3	4912-48	371	3/25/2005	Grading, Bit Surfacing, Bridges, Box Culverts	Daily Incentiive
4	2102-50	29	3/26/2004	Grading, Storm Sewer, Concrete Surfacing	Daily Incentive
4	1480-139	94	1/28/2005	Bit Surfacing and Ditch Cleaning	Liquidated Savings
4	0307-11	113	5/22/2005	Bit Surfacing	Liquidated Savings
METRO	2738-20	101/94	5/20/2005	Deck Overlay, Joint Repair, Guardrail	Intermediate Incentive

Table 4 – Projects with Incentive Clauses

C. PROJECT COSTS AND INCENTIVES PAYOUTS

Listed below in the following table are the engineer estimates, low bid, maximum incentive amounts and the amount of incentives paid out on each of these projects.

District	SP	Hwy	Eng Estimate	Low Bid	Daily Incentive	Max Incentive	Max Inc. % of Bid	Paid Incentives
2	6803-38	11	$ 3,317,302	$ 3,493,951	$ 3,000	$ 75,000	2.1%	TBD
3	4912-48	371	$ 18,489,835	$ 15,856,301	$ 10,000	$ 250,000	1.6%	$ 250,000
4	2102-50	29	$ 6,357,301	$ 6,863,097	$ 5,000	$ 300,000	4.4%	$ 300,000
4	1480-139	94	$ 1,685,417	$ 1,765,829	$ 1,250	No Max	--	0
4	0307-11	113	$ 1,677,934	$ 1,422,933	$ 1,250	$ 31,250	--	$ 5,250
METRO	2738-20	101/94	$ 618,947	$ 601,335	$ 10,000	$ 50,000	8.1%	$ 50,000

Table 5 – Project Cost, Maximum Incentives and Paid Incentives

On four projects, the low bid came in under the engineers estimate. The other two projects were 5% and 8% over the engineers estimate. There is currently not enough data to determine if contractors are adjusting their bids in anticipation of obtaining the incentive to offset costs.

D. CASE STUDIES

TH 29 – Broadway to CR 70 (SP 2102-50)

This project consisted of a major urban reconstruction of TH 29 through the City of Alexandria. The project would impact approximately 1.4 miles of TH 29 through a commercial segment of Alexandria that relies heavily on tourism.

An incentive of $5,000 / Calendar Day was added to the contract for each before September 1, 2005 that the project was completed (up to a maximum of $300,000). The contractor completed the project early and obtained the maximum incentive. The Mn/DOT project engineer though the project was a huge success.

TH 94 – TH 336 to Downer (SP 1480-139)

This project used liquidated savings as an incentive for contractors to complete the work earlier than anticipated. The project was completed in the maximum amount of allotted time (27 working days) and no liquidated savings or damages were charged. The project engineer indicated that the contractor did not attempt to increase production to meet the incentive.

TH 113 – CSAH 4 to TH 71 (SP 0307-11)

This project included liquidated savings in the amount of $1250 / day for early completion on a 25 Working Day contract. The project included bituminous surfacing on 27.9 miles of TH 113 in District 4. Although the contractor did not appear to expedite the schedule to obtain the liquidated saving incentive, the project was completed in 21 working days and an incentive of $5250 was paid.

TH 371 – TH 10 to CSAH 48 (SP 4912-48)

The four lane expansion of nine miles of TH 371 included a daily incentive of $10,000 (maximum of $250,000) for each day the roadway was open to four-lanes of traffic prior to October 29, 2005. The $15.9 million project also included a contract clause that capped the disincentive at $10,000 per day with a maximum disincentive of $250,000.

Due to weather caused delays on other projects in the state, the contractor was able to mobilize additional crews and equipment to complete the grading work on this project. The project will completed in the fall of 2005 and a substantial incentive payment is anticipated.

TH 371 Construction

TH 11 – City of Roseau (SP 6803-38)

The reconstruction of TH 11 through the City of Roseau requires detouring traffic to local streets and impacting access to homes and businesses along the corridor. The project involved multi-stage construction over a two-year period. To expedite construction, an incentive clause of $3,000 per day was added for completing the work in any of the stages 1-4 early, with a maximum incentive of $75,000. Construction will be completed in 2007.

TH 11 Reconstruction - Roseau

TH 94/101 Over the Crow River (SP 2738-20)

Mn/DOT recently completed a project to rehabilitate the existing bridge decks on I-94 over the Crow River in the northwest corner of the Metro District. This segment of I-94 carries a significant amount of commuter traffic to the Twin Cities area. Work on a portion of this project required restricting traffic to a single lane on I-94.

The project combined A+B bidding with an incentive on an intermediate completion date. The intermediate completion date specified a maximum number of days (12) that I-94 could be reduced to a single lane. An incentive of $10,000/day (maximum of $50,000) for completing the single lane portion of the project faster than the 12 working days was added. Mn/DOT. The contractor completed the work in 5 days and received the maximum amount of incentive. To obtain the bonus, the contractor used multiple crews and extended hours of work.

E. CONCLUSIONS

- On projects with incentives (except those with liquidated savings), the contractor used extra effort to complete the project early in order to obtain the bonus.

- There is currently not enough data to determine if contractors are adjusting their bids in anticipation of obtaining the bonus to offset costs.

- On projects with incentives, the contractor used aggressive schedules that placed some strains on Mn/DOT oversight staff.

- Contractors did not appear to expedite construction times when liquidated savings was offered as a bonus.

F. RECOMMENDATIONS

- Continue to promote the use of incentives on projects and encourage districts to cap incentives.

- Develop guidelines on appropriate incentive amounts and special provisions.

- Continue to encourage the liquidated savings concept statewide and on a variety of project types. Contractors in other districts may see liquidated savings as a significant incentive to reduce contract time.

IV. Lane Rentals

A. Purpose

The lane rental concept is used to encourage contractors to minimize road-user impacts. The contractor is required to pay a rental fee for closing lanes or shoulders during construction. Mn/DOT established a rental fee rate which is dependant on the number and time lanes are closed. The contractors are required to submit their proposed lane rental times with their bids. Similar to the A+B method, the amount of the total lane-rental charges a contractor proposes can be combined with the cost for the work items to determine the successful bidder.

During the project, the fee is assessed for the time that the contractor occupies or obstructs part of the roadway and is deducted from the monthly payments. If a contractor exceeds the proposed time within their bid, they are assessed a penalty in the amount of the rental fee rate. Often, the contractor is awarded an incentive for any un-used hours of their bid.

B. Project Types

The lane rental concept has been applied to six (6) projects since 2000. Listed below are the project types.

District	SP	Letting	Hwy	Project Type	Bid Cost
1	6915-122	6/11/2004	53	BIT MILL AND OVERLAY, CULVERTS, SIGNAL	$ 4,582,093
1	5915-125	4/22/2005	53	GRADING, BIT PAVING, SIGNALS, BRIDGE	$ 12,449,548
2	0416-39	5/21/2004	197	BITUMINOUS OVERLAY	$ 176,605
METRO	6212-9276	6/25/2004	36	BRIDGE PAINTING	$ 439,379
METRO	6212-9212	11/19/2004	36	BRIDGE PAINTING	$ 395,549
METRO	2724-115	3/25/2005	55	BITUMINOUS MILL AND SURFACING	$ 948,739

Table 6 – Lane Rental Project Types

The lane rental concept has been applied using different methods on several of these projects. Listed below are the types of applications that several districts have applied to the lane rental concept.

- Reduce Impacts to Intersections (TH 55 Metro)
- Reduce flagging operations time (TH 53 in District 1)
- Reduce long-term (24 hour) lane closures (TH 36 Project in Metro)
- Reduce lane closures on multi-lane highways (TH 53 in District 1)

TH 53 in District 1 (SP 5915-125)

TH 53 in District 1 (SP 5915-125)

C. Establishing Fees

Mn/DOT established hourly roadway fees for lane and shoulder closures. The fees often included peak hour peak, non-peak hour and weekend work restrictions. Fees are developed from roadway user costs.

On SP 6915-122, District 1 established a Lane Rental Working Fund of $160,000 for the project. The contractors were not required to bid the number of hours for this project. Each time the contractor used a lane rental (depending on the time and location), the lane rental fee was subtracted from the Lane Rental Working Fund. At the end of the project, any amount remaining in the Lane Rental Working Fund would be paid as an incentive to the contractor. A negative amount would result in a disincentive deduct from the contract payment.

On SP 2724-115, the metro district applied the lane rental concept to the impact on signal systems. Rather than have the contractor bid a lane or shoulder closure, the contractor bid on the number of signal system impacts with the bituminous pavement project in south Minneapolis.

D. Impacts on Bids and Incentives

Listed below is a summary of the low bid awards for the six project using lane rentals.

District	SP	Hwy	Project Type	Bid Cost	Lane Rental	Paid Incentive
1	6915-122	53	BIT MILL AND OVERLAY, CULVERTS, SIGNAL	$ 4,582,093	$ 160,000	$ 40,000
1	5915-125	53	GRADING, BIT PAVING, SIGNALS, BRIDGE	$ 12,449,548	$ 100,000	TBD
2	0416-39	197	BITUMINOUS OVERLAY	$ 176,605	$ 9,800	0
METRO	2784-304	494	MAJOR RECONSTRUCTION - DESIGN/BUILD	$ 135,639,711	TBD	TBD
METRO	6212-9276	36	BRIDGE PAINTING	$ 439,379	$ 13,200	$ 3,700
METRO	6212-9212	36	BRIDGE PAINTING	$ 395,549	$ 80,300	$ 26,300
METRO	2724-115	55	BITUMINOUS MILL AND SURFACING	$ 948,739	$ 89,250	$ 38,500

Table 7 – Lane Rental Impact on Bids and Incentives

- Four of the projects were awarded to the low cost bidder and lane rental did not impact the award of the contract.
- On SP 6915-122, Mn/DOT established Lane Rental Working Fund of $160,000 for the project and contractors were not required to bid the lane rental time.
- On the I-494 Design-Build project, lane rental is only being applied during the pavement marking warranty period. If the contractor needs to perform corrective action after the permanent pavement markings are placed, a lane rental fee will be assessed.
- On SP 2724-115, the contractor with the fourth highest cost for work items was awarded the contract. This contract bid substantially less time than the other contractors and was awarded the contract using the A+B theory.
    - The contractor bid mostly weekend work in a condensed schedule. Other contractor bid some weekday work with higher lane rental fees.
    - The lane rental bids were in order of low bid:
        - $89,250 (119 hours)
        - $182,500 (268 hours)
        - $170,250
        - $220,000 (314 hours)
        - $179,000 (217 hours)
- On SP 6212-9276, the awarded contractor bid twice the amount of time as the second bidder, but was awarded the contract due to the cost savings associated with the work item “A” portion of the bid.

E. IMPACTS ON SAFETY

The impact of safety needs to be addressed with all projects, especially on projects with accelerated schedules. Contractors set-up lane closures not only to protect the traveling public, but to protect the safety of their workers. There was some concern regarding contractor taking more safety risks to reduce lane rental costs. This included working at nights instead of the day and reducing buffers distances between operating equipment/workers and the traveling public.

To combat the potential safety issues, District 1 provided guidelines to the contractor on when lane closures would be required. The plans included details on the distance and height of drop-offs adjacent to traffic, backfilling requirements, and minimal work zone safety areas required. Attached in Appendix D is the plan sheet that District 1 included in their TH 53 project.

F. Impacts on Quality

Similar to the comments received on the A+B projects, many field staff believed that the lane rental concept may have reduced the quality of work. Lane rentals work was often done at night when lower rental fees occurred. The increased rate of production may have also compromised some quality of work. The extended work hours also placed on strain on Mn/DOT and contractor personnel.

G. BENEFITS ON LANE RENTALS

Many field personnel observed many benefits of using the lane rental tool:

- Contractors were faster at taking down lane closures
- Contractors were required to think more about reducing contract time during the bidding process
- Inspectors saw a reduction in lane closures where no/minimal amount of work was being done
- Incentives for limited lane rentals encouraged contractors to reduce lane closure times.

H. LESSONS LEARNED

Many field personnel also provided input on the difficulties of administering lane rentals:

- In some cases, the extra work was occurring along with the normal construction operations that made it difficult to assess if lane rental charges should be invoked.
- On a moving operation, it was sometimes difficult to monitor the lane rental impacts. For example, the TH 55 mill/overlay project had different lane rental charges on the number of intersections impacted.
- Further guidance in specifications on turn lane closures needs to be addressed.

I. CONCLUSIONS

- Lane rental is an effective tool to reduce the amount of lane closures on projects.
- Without good specifications and enforcement, the use of lane closures may decrease safety. To reduce lane rental expenses, contractors may be hesitant to install lane closures when they may be needed to protect workers and/or motorists.
- Awarding incentives for early completion also helped reduce lane closure impacts.
- Some field personnel believe that lane rentals may also decrease quality of work. Contractors will work more night hours when lane rental times are typically lower.

J. RECOMMENDATIONS

- Develop guidelines for using lane rentals on Mn/DOT and local projects.
- Continue to monitor lane rental use on Mn/DOT projects.

V. Pay for Performance

A. PURPOSE

Pay for Performance is used measure the final performance of an item compared to performance criteria established in the contract. Unlike traditional specifications where the owner assumes the risk if the contractor is in compliance with the specification but the final outcome is not acceptable, Pay for Performance requires the contractor to correct any deficiencies.

B. APPLICATIONS

Mn/DOT has instituted the Pay for Performance specification on only one project, the I-494 design/build project in the Metro Division. Pavement striping performance will require a product's retro-reflectivity and color to meet or exceed established durability and quality standards, as specified by the warranted values. The performance period is five years. The specifications outline the method of evaluating reflectivity and measuring reflectivity during the warranty period. The contractor will be required to replace any defective pavement markings not meeting the specified criteria in the contract. Since this project is still under construction, no evaluation of the pavement markings has occurred.

C. BENEFITS

A level of risk is shifted from the owner to the Contractor. The contractor then reduces his/her risk by providing a quality product that will last a longer duration.

D. DRAWBACKS

The use of Pay for Performance often requires Mn/DOT to monitor the effectiveness of the product over a longer period of time. This increases Mn/DOT's monitoring costs. This system may place a financial burden on the contractor if they have to finance a portion of the work for the duration of the performance period.

E. CONCLUSIONS

- Pay for Performance may be an effective tool to improve quality, but there is not enough data at this time to evaluate it's effectiveness.

F. RECOMMENDATIONS

- Monitor the Pay for Performance pavement marking items on the I-494 Projects
- Identify additional items to apply Pay for Performance specifications.
- Identify projects to apply Pay for Performance items and specifications.

VI. Warranties

A. Purpose

The goal of instituting warranties on projects is to improve the quality and durability of products by allowing a longer timeframe to accept work constructed by contractors. This process is also aimed to encourage contractors to improve their construction techniques and use better equipment to meet the warranty requirements. With warranties, there is potential to decrease the level of inspection required by Mn/DOT.

Since the mid 1990's, Mn/DOT has been working to incorporate warranties into roadway and bridge construction projects. Since this time, Mn/DOT has developed specifications and implemented pavement and other warranties on design-build and design-bid-build projects. Listed below are the projects that have implemented warranties.

Design-bid-build Projects

DISTRICT	SP	HWY	DESCRIPTION	LENGTH (MI)	BID COST	COMMENTS
1	1601-59	61	BIT MILL AND SURFACING, TURN LANES	7.69	$ 1,224,170	2 YEAR - BIT
2	1102-59	2	BIT MILL AND OVERLAY AND CULVER REPAIR	N/A	$ 2,335,249	2 YEAR - BIT
2	6803-38	11	GRADING, STORM, BIT PAVING	1.16	$ 3,493,950	GRADING
3	8604-30	25	BIT MILL AND SURFACING AND CULVERTS	9.75	$ 1,593,522	2 YEAR - BIT
4	2101-20	27	BIT MILL AND SURFACING, TURN LANES	3.5	$ 1,246,695	2 YEAR - BIT
6	2512-10	60	BIT MILL AND OVERLAY, RT LANES	12.04	$ 1,107,893	2 YEAR - BIT
6	7901-41	42	BIT MILL AND OVERLAY, TURN LANES, CULV	12.42	$ 2,853,876	2 YEAR - BIT
7	0804-73	14	GRADE, BASE, BIT SURFACING, STORM	2.5	$ 6,989,888	2 YEAR - BIT
8	8827-56	VAR	BIT ROUTE AND SEAL	VAR	$ 87,511	ROUTE AND SEAL
METRO	2744-54	212	BIT MILL AND OVERLAY	3.5	$ 1,527,665	2 YEAR - BIT
METRO	1926-17	316	GRADE, BIT SURFACE, LIGHTINTG	9.35	$ 553,563	2 YEAR - BIT

Table 8 – Design-bid-build Projects with Warranties

Bituminous Warranties

- Warranty bonds generally were in the amount of 20% of the total bid amount for the warranted bituminous pavement items
- Mn/DOT conducted pavement distress surveys to monitor the pavements
- The 2-year warranty period covered transverse and longitudinal cracking, debonding, raveling, flushing, rutting and pop outs.

Excavation and Embankment

- Warranty on subgrade excavation embankment and aggregate base placed on the roadway below the pavements, including over culverts and utilities
- Established threshold limits for differential settlements and recommended correction actions.
- 2-year warranty period
- No special bonding requirements

Route and Crack Sealing

- Warranty covers 100% of the cost of removing and replacing defective material
- Performance bond required for the duration of the warranty period
- Failure to comply results in forfeiture of performance bond and banned work on Mn/DOT saw and seal projects for 1 year.

Design/Build Projects

DISTRICT	SP	HWY	WARRANTY TYPE	BID PRICE
4	1401-150	10/32	3 Years - All elements of the project	$ 8,600,000
6	5502-67	ROC 52	1 Year - Turf Establishment and ITS 2 Years - Signing, Signals, Lighting, Utility Relocations 5 Years - Pavement, Structural Concrete, Steel Paint, Walls, Roadway Grade	$ 236,000,000
7	7408-29	14	1 Year - Landscaping and Turf Establishment 5 Year - Pavements, Structural Concrete, Bridge Bearings & Expansion Joints Geotechnical Settlement, and Permanent Signing	$ 10,044,000
METRO	2735-172	100	6 Months - Traffic Mangement Systems 1 Year - Landscaping and Turf Establishment 5 Years - Pavements, Structural Concrete, Bridge Bearings and Expansion Joints Roadway settlement, wall settlement, Signing and Signals	$ 15,400,000
METRO	2785-304	494	3 Years - All elements of the project	$ 135,600,000
METRO	1017-12	212	3 Years - All elements of the project	$ 238,000,000

Table 9 – Design-Build Projects with Warranties (note: bid prices are rounded)

- The warranty bonds varied between the projects. For example, on ROC 52, the contractor was required to submit a $20,000,000 warranty bond and on I-494, TH 212 and TH 10/32 projects, a warranty bond in the amount of 4% of the contract amount was required for the first 2 years of the warranty and a 2% warranty bond was required for the remaining year of the warranty.

- On the TH14, TH 100 and ROC 52 projects, the warranty items, threshold criteria and corrective actions were clearly defined in the contract documents.

- On the TH 494, TH 212 and TH 10/32 projects, the contract specify that all elements of the project required a 3 year warranty. The contract provided details on the threshold criteria for pavements, but no other criteria or corrective action guidelines were included.

B. WARRANTY LENGTHS VERSUS OTHER STATES

Mn/DOT has instituted warranties varying from 2 to 5 years. This length of time is consistent with several surrounding states. Illinois uses a 5 year minimum warranty period. Wisconsin uses a five-year warranty and the contractor is responsible for any maintenance when the pavement distress threshold is exceeded. Michigan typically warrants their pavements for two to three years.

The incorporation of a long term 20-year warranty was also considered for a major reconstruction project on TH 371 in District 3. However, several key issues arose during negotiations that caused Mn/DOT to reconsider this option for TH 371.

- The project is being constructed on excellent grading material, making sub-grade failures less likely. The cost/benefit of the warranty would likely be low on this project.
- The maximum liability limit was capped at 1.5 times the warranty cost, thereby extending some additional risk back to Mn/DOT.
- There was also some concerns on what costs were being applied to the maximum liability limit (e.g. bonding costs and pavement rating)
- The warranty included a 3% inflation cost to protect the warranty company from spikes in bituminous costs, also extending additional risk to Mn/DOT.

New Mexico has used long term warranties on several projects. Some of these roadways are experiencing some heaving and cracking problems. New Mexico and the warranty company are currently addressing these issues.

C. WARRANTY BENEFITS

- Increased product quality (lower life-cycle costs)
- Encourages innovative construction techniques and methods to improve quality
- Potential reduction in agency staffing during construction
- Lowered risk to owners by shifting responsibility to contractor to maintain

D. Warranty Drawbacks

- Mn/DOT must monitor the project in greater detail during the warranty period.
- Enforcement of the warranty over longer periods of time may be difficult.
- Warranty violations and method and standards of identifying and correcting deficiencies may be debated.
- Bonding and insurance requirements may eliminate smaller companies from bidding.
- Paving contractors may be uncomfortable with warranty issues when the grade is constructed by another contractor.
- Potential increase in contract times. Contractors will spend more time addressing minor issues that may impact the performance of the warranty item.

E. Warranty Projects Updates

Design-bid-build Projects

Only one project has recently encountered issues that may involve additional corrective action by the contractor. On TH 316, several wearing course pop-outs occurred during the summer of 2005. The pop-outs are in an isolated area on southbound TH 316 near the Goodhue/Dakota County line. Metro Division is currently evaluating the corrective action required and will continue to monitor the pavement during the life of the warranty.

Above – Wearing Course Pop-out
Right – Location of pop-out in SB Lane

Design-Build Projects
Although most of the design-build projects are still under construction and have not started the warranty period, several of the earlier low-bid design build projects have been completed. These low-bid design-build projects include TH 100 in Golden Valley (Metro) and TH 14 near Owatonna in District 6.

On TH 100, there have been no issues to date that have required corrective action by the contractor.

However, on the TH 14 design-build project, corrective action is required by the Contractor. The warranty pavement includes an overlay segment that is experiencing some significant transverse cracking and rutting. Mn/DOT performed a pavement distress evaluation and identified several areas that need to be addressed by the Contractor.

According to Mn/DOT records, the 5-year warranty period is currently in the third year. The Contractor is required to route and seal all joints after the fourth year. To reduce costs, the Contractor has debated the start of the warranty period with Mn/DOT, stating that the warranty period should begin before all of the final paperwork for the project is complete. This would reduce the number of mobilizations required to route and seal the joint. Mn/DOT and the contractor are currently resolving this dispute and the route and seal requirements are scheduled to be completed in the fall of 2005.

TH 14 Transverse Cracking

TH 14 Transverse Cracking

F. COST COMPARISONS

An analysis was performed to determine if contractors are bidding significantly higher prices on warranty bituminous items compared to similar non-warranty items. The analysis examined:

- Projects that had both warranty and non-warranty items with the same mix design and,
- Non-warranty projects with similar bituminous bid items that were let within 3 months of the warranty projects in the same district.

There were no apparent trends in the data to suggest that the unit bid prices for warranty items increased compared to non-warranty items. Please note that this analysis did not account for constructability constraints, quantity differences and/or truck hauling costs that differ between the projects.

Based on information provided by Mn/DOT Estimating Unit, contractors are likely including costs to address warranty corrective actions within the mobilization item.

G. LESSONS LEARNED

- There does not appear to be any significant changes in the way bituminous pavements are constructed with a 2-year warranty.
- Warranties require additional effort by the districts to monitor the performance of items during the warranty period.
- There did not appear to be significant added value with 2-year bituminous warranties.

H. CONCLUSIONS

- Additional time is required to assess the effectiveness of long term (5-year warranties) on many of the design build projects.
- Except for two projects (both design-build and design-bid-build), projects with warranties have not experienced any significant issues since construction.
- *Costs – add something here following the analysis.*
- Several design-build projects specified warranties, but provided no guidelines on the threshold criteria or corrective action process required. This may lead to difficulty enforcing the warranty if a concern arises during the warranty period.
- No Significant changes to the bituminous construction practices were identified by field personnel on projects with two-year warranties.
- The implementation of long term (20 year) warranties of bituminous pavements is currently not a cost effective tool for Mn/DOT to implement at this time.

I. RECOMMENDATIONS

- Continue to monitor the effectiveness of short term (2-5 year) and long term (20-year) bituminous warranties in other states.
- Continue to monitor the 2-5 year warranties on the design-build and design-bid-build projects currently in effect in Minnesota.
- Develop additional threshold and corrective action guidelines for implementation on future design-build and design-bid-build projects. The guidelines should also clearly define when the warranty period begins.
- Gather input from the industry on the use of warranties, including bonding and contractual issues.

VI. Pre-Cast Components

A. Purpose

The use of new and innovative pre-cast concrete components was implemented on several projects throughout the state. These new systems include pre-cast concrete pavement slabs on TH 62 in the Metro District and pre-cast concrete slab systems on bridges on TH 8 in Chisago County and on TH 72 over the Tamarac River in District 2. The intention of these new systems was to examine ways to reduce construction time and reduce delays to motorists during construction.

B. Pre-Cast Concrete Pavements onTH 62

On Tuesday, June 21, 2005, a test project involving the installation of precast concrete pavement panels was conducted on a pavement rehabilitation project on TH 62 between I-35W and TH 55 in the southeast metro (SP 2775-12). The purpose of this test project was to evaluate the use of precast pavement panels to reduce construction time.

The test segment included installation of 18 precast pavement panels on the outside lane of eastbound TH 62 near 40th Avenue. The repair segment included a continuous 218' stretch of pavement 12' wide.

Construction sequences involved removing the old slab, adding a stone-dust aggregate and fine grading with special machinery, placing the new slabs, and grouting the slabs together. Work on replacing the 218' stretch took approximately 2 days. The costs on this type of repair were approximately 8 times higher compared to a standard D-1 repair.

Fine-grading for Pre-cast pavement

Setting pre-cast concrete pavement

The use of pre-cast panels has the potential to significantly reduce cure time and reduce lane closure time. If staged correctly, this type of pre-cast system could be used to repair small areas (1 panel) without disrupting peak hour traffic.

A detailed report of this project was compiled by the Office of Construction and Innovative Contracting. The report details the construction procedures, timelines, safety impacts, costs, and provides specifications and plans for the panels. The report can be found at the following website:

http://www.dot.state.mn.us/const/tools/

C. Pre-Cast Concrete Bridge Slab Systems

Two projects were selected for the implementation of pre-cast concrete slab systems. The projects include SP 1301-91 (TH 8 in Chisago County) and on SP 0143-29 (TH 72 over Tamarac River) in District 2. The TH 8 project included a 3-span structure with span lengths of 22'-27'-22'. The project on TH 72 involved replacing the deck on the 3-span voided span structure (45' spans).

The system includes inverted-t structures that that act as the deck falsework. The panels are approximately 6 feet wide and 1 to 1-4" tall depending on the span. After the tees are placed, additional reinforcement is added to tie the segments together and the final deck (minimum 4" over the pre-cast panels) is poured.

The project on TH 8 also attempted to utilize pre-cast abutments and pile caps. However, due to the weight of the abutments, the contractor was not able to pre-cast these elements off-site and deliver them to the project site. Instead, these elements were cast on-site, picked by a crane, and placed on the piles.

The benefits of this system include:

- Pre-stressed pre-cast slabs allow for slender sections
- No deck falsework (except sides)
- Limited stream interruption
- Controlled pre-cast environment and higher quality control.
- Simple non-specialized construction methods and equipment
- Decreased field construction time.
- Standardized cross-section shape can be used on multiple projects.

TH 72 over Tamarac River

These projects are still currently under construction. For more information, please refer to Mn/DOT Bridge web-site. The web-site offers more details and plans for these projects.

http://www.dot.state.mn.us/bridge/PrecastSlabSystem/PrecastSlabSystem.html

H. CONCLUSIONS

Pre-Cast Concrete Pavement Panels

- Although the costs of pre-fabricated concrete pavement panels are substantially higher than standard DOT repairs, the elimination of cure time can be significantly reduce lane closure time and reduce traffic impacts. User-costs need to be carefully considered when selecting this type of rehabilitation strategy.

- Work zone safety needs to be considered when using this type of rehabilitation. On a project-by-project basis, the project engineer should carefully weigh the safety measures of using barrier versus the time factor involved with opening the lane to traffic.

- The production rates on this project may not necessarily reflect the production rates on projects that require rapid turn around. This operation was not on the critical project path. In addition, the contractor had a learning curve with installing the new system.

- It is possible that on smaller repair areas, a pre-cast repair could be made during the day or night, and re-opened to traffic before the next rush hour. This would involve opening the lane to traffic before the joints were sealed and shoulder repaired. A subsequent "off-peak" lane closure would be required to complete this work.

Pre-Cast Concrete Bridge Slab Systems

- Pre-cast concrete bridge slab systems have the potential to significantly reduce field construction time by eliminating the need for falsework.

- By casting the bridge slab systems in a controlled environment, the quality of construction should significantly increase.

- These systems are relatively expensive compared to standard construction practices due to the start-up costs for the pre-fabricators. Costs are anticipated to decrease as more projects are constructed with this technology.

- Environmental impacts can be reduced by minimizing stream/river impacts during construction. This type of construction can also improve navigation under these bridges during construction.

I. RECOMMENDATIONS

- Continue to monitor the long-rang durability of pre-cast concrete pavement panels and compare the durability to the type C and type D repairs also performed on the TH 62 pavement rehabilitation project.

- Educate designers and construction personnel on the successes and drawbacks of these pre-cast concrete product projects.

- Continue to work with Mn/DOT Bridge Section of assess the cost and construction timeline impacts of the pre-cast bridge slab components and identify future projects for implementation.

VII. Other Innovative Contracting Techniques

In addition to the innovative contracting techniques stated above, Mn/DOT has in the past used other techniques to decrease construction time and road user impacts. Listed below are some additional alternatives:

Flexible Starting Dates

Allows the contractor to pick the starting date of a project. This technique provides the contractor more time to plan and schedule the use of equipment and manpower to the start of construction. Scheduling problems that may delay contract time completion are avoided. Mn/DOT currently uses this tool on certain projects.

Constructability Reviews

On projects with multiple staging or methods for innovative construction, the use of constructability reviews with members of the construction industry can be a valuable tool. Constructability reviews are done at various times during the design. In a 1999 AASHTO study, states that use constructability reviews have reported fewer change orders, better plans, fewer claims, reduced contract time, reduced impacts to motorists and better understanding of the project by construction personnel prior to construction.

Construction Manager at Risk

Under this procedure, Mn/DOT would select a design and Construction Management (CM) consultant on the basis of qualifications, experience, fees and prices for the target cost of construction. During the preliminary design phase the construction manager provides input into the project to help control cost and achieve the project objectives. At some point during the design (typically 60-90% of completion), the owner and the CM negotiate a Guarantee Maximum Price (GMP). The CM must complete the project within this price. The CM assumes all the risk by holding all of the sub-contracts. The Florida DOT currently uses this procedure. The CM is selected based on Florida's standard consultant selection process.

Lump Sum Projects

A contractor is provided a set of bid documents and is required to calculate the quantities and develop a lump sum bid for all work. Costs associated with changed or unforeseen conditions as well as added or deleted work is negotiated using standard practices.

Bid Averaging Method

Florida currently uses bid averaging to contractors to bid a true and reasonable cost for a project. This method allows the contractor to bid what the actual project will cost without "needing" to be the lowest bidder. Bid averaging is not used on federally funded projects. If 5 or More Bids are received, the Department excludes the high and low, then averages the rest and selects contractor closest to the average. If 3 or 4 bids are received, the Department averages all bids and selects contractor closest to the average. If less Than 3 Bids are received, the Department rejects all bids and re-advertises the project.

Multi-Parameter Bidding Including Quality (A+B+Q)

Similar to A+B, but the contractor also bids the number of warranty years. A contractor is given a credit for every year that he bids on the warranty. Maryland and Kentucky have used this method.

No Excuses Incentives

Several states have implemented a No Excuses Bonus or "drop-dead-date" for completion of a phase of work or the entire project. If work is completed in advance of the date, the contractor receives an incentive. If the date is not met, liquidated damages are assessed (but not a dis-incentive). There are no excuses such as weather delays, quantity overruns, or changed conditions.

Design-Build-Maintain (Operate)

Several states have implemented this method, most on toll road projects. Mn/DOT has used a form of this method on the I-394 Fast Lanes project.

Design-Sequencing

Design sequencing is intended to expedite construction prior to final completion of the plan sets by the owner (or owner representative such as a consultant). This process is currently being used in California. Caltrans prepares a plan to approximately 30% and lets the contract to the low bidder. Caltrans then completes the design during the early stages of construction. The bid document include all of the bid items, but the quantities are only provided within 25% of the final quantities.

Indefinite Quantity / Indefinite Delivery

Contractors bid on unit work items with the location to be determined under future work orders. Delaware uses this for road rehabilitation programs on overlay contracts throughout the state. Many states use it for signal installation or signal maintenance.

Alternative Bids / Design

Although discouraged by the FHWA, the use of alternative bids for items is a method to potentially reduce costs and save time. Some states allow contractors to bid alternative structures at the time of bidding.

Active Management Payment Mechanism

England is currently moving from A+B and lane rental to active management payment. The contract offers an incentive to maximize the availability of open lanes. The British Highways Agency measures the average speed through the workzone and the actual traffic flow. Incentives will be based on measure travel speed and the measured volumes in comparison with theoretical percentages of roadway capacity. Arizona has used this concept on a 13-mile construction zone.

This mechanism may be difficult to implement within the Twin Cities or other metropolitan regions in the state. The large variations in traffic flows, the use of alternative routes for incident management, the variations in traffic flows through a workzone may vary greatly day to day and may be beyond the control of the contractor.

Appendix A

Summary Table of Innovative Contracting Projects

INNOVATIVE CONTRACTING SUMMARY

A+B PROJECTS

DISTRICT	SP	HWY	LOCATION	DESCRIPTION	LENGTH (MI)	LETTING	BID COST	COMMENTS
2	6001-52	2		BIT RECLAM, SURFACING		11/2005		
3	1809-55	371	CR 48 TO 58TH STR	GRADING, BIT, SIGNING, CULV, 2 BRIDGES	21.8	3/14/2003	$ 17,589,834	
3	1804-48	169	CROW CTY LINE TO TH 27	BIT MILL & SURFACING, CULV, TURN LANES	18	4/28/2000	$ 2,687,000	
4	6108-18	55	TH 28 TO CNTY LINE	BIT RECLAM, BIT MILL, SURFACING, CULV WORK	15.6	4/22/2005	$ 3,759,912	DETOUR ROUTE
6	2480-81	35	STATE LINE TO I-90	UNBONDED CONC OVERLAY & BRIDGE REHAB	13.5	3/29/2002	$ 14,684,234	
6	6680-96	35	1.6 MI S OF TH 19 TO CSAH 2	UNBONDED CONC OVERLAY, BR, LIGHTING	9.1	3/26/2004	$ 8,421,870	
6	2480-99	35	STATE LINE TO I-90	UNBONDED CONC OVERLAY & BRIDGES	13.5	11/19/2004	$ 13,244,612	
6	2481-41	90	TH 13 TO CSAH 46	UNBONDED CONC OVERLAY, BR, LIGHTING	11.5	2/23/2001	$ 8,807,804	
7	0702-107	14	LOR RAY TO 3RD AVE	CONC PAV'T, LIGHTINGT, SIGNALS, BRIDGES	3.1	4/27/2001	$ 8,342,899	
7	1703-0064	60	TH 62 TO S JCT TH 60	MILL & OVERLAY	13.1	3/29/2002	$ 2,790,278	
7	5202-24	14	NEW ULM TO NICOLLET	BIT MILL AND OVERLAY, TURN LANES	13.2	12/19/2003	$ 2,267,784	
7	5212-24	169	BR 9098 TO LAKE STREET	BIT MILL AND OVERLAY, CONC PVT REHAB	3.02	1/23/2004	$ 1,983,157	
7	5380-112	90	1 MI E OF RUSHMORE TO TH 60	BIT MILL AND OVERLAY	10.6	11/16/2001	$ 2,648,292	
METRO	0209-22	169	CITY OF ANOKA	URBAN RECONSTRUCTION	1.32	5/25/2001	$ 7,514,693	
METRO	2738-20	101/94	STATION TO STATION DESCRIP	DECK OVERLAY, JT REPAIR, GUARDRAIL	---	5/20/2005	$ 601,335	
METRO	2780-0053	94	CROW RIVER TO 494	SHLG REPLACEMENT & WIDENING & BRIDGES	---	2/22/2002	$ 7,198,438	INT. INCENTIVE
METRO	6280-304	35E/694	UNWEAVE THE WEAVE	MAJOR INTERCHANGE RECONSTRUCTION		9/26/2005	$ 102,000,000	B+C

Note: Projects let after 8/1/2005 are not included in the 2000-2005 IC report.

INCENTIVE/DISINCENTIVE OR LIQUIDATED SAVINGS

DISTRICT	SP	HWY	LOCATION	DESCRIPTION	LENGTH (MI)	LETTING	BID COST	COMMENTS
2	6803-38	11	TH 89 TO ROSEAU EAST LIMITS	Grading, Sewer, Sanitary, Sidewalk, Bit Paving	1.2	6/10/2005	$ 3,493,951	MULTI-STAGE
3	4912-48	371	TH 10 TO CSAH 48 IN LITTLE FALLS	Grading/Bituminous, Culverts, Lighting, Bridges	8.9	3/25/2005	$ 15,856,301	LOW SP 4908-18
3	8612-11	241	CSAH 19 to 1/6 Mi E of I-94	Grading, Conc, Bit, Box Culverts, Signal System	3.52	9/23/2005	$ 14,484,740	MULTI-STAGE
4	2102-50	29	BROADWAY TO CR 70	Grading, Sewer, Conc Surfacing, Utility Improv	1.44	3/26/2004	$ 6,863,097	MULTI-STAGE
4	1480-139	94	TH 336 to Downer	Bit Surfacing & Ditch Cleaning	8.26	1/28/2005	$ 1,765,829	Liquidated Savings
4	0307-11	113	CSAH 4 TO TH 71	Bit Surfacing	27.9	5/220/05	$ 1,422,933	Liquidated Savings
METRO	2780-0053	94	CROW RIVER TO 494	Bridge Rehab and Shld replacement	---	2/22/2002	$ 7,198,438	Intermediate w/A+B

LANE RENTALS

DISTRICT	SP	HWY	LOCATION	DESCRIPTION	LENGTH (MI)	LETTING	BID COST	COMMENTS
1	6915-122	53	BASSWOOD - 94	BIT MILL AND OVERLAY, CULVERTS, SIGNAL	12.26	6/11/2004	$ 4,582,092	POOL OF FUNDS
1	5915-125	53	SKYLINE TO TH 194	GRADING, BIT PAVING, SIGNALS, BRIDGE	2.28	4/22/2005	$ 12,449,548	ENDS IN 07
2	0416-39	197	3RD ST TO 23 ST, BEMIDJI	BITUMINOUS OVERLAY	1.42	5/21/2004	$ 176,605	
METRO	6212-9276	36	AT CLEV & 35 TO TH 36	BRIDGE PAINTING	---	6/25/2004	$ 439,379	
METRO	6212-9212	36	EDGERTON - SOO LINE	BRIDGE PAINTING	---	11/19/2004	$ 395,549	
METRO	2724-115	55	32ND TO 46TH ST	BITUMINOUS MILL AND SURFACING	2.03	3/25/2005	$ 948,739	INTERSECTIONS

APPENDIX A

WARRANTIES

Design-Bid-Build

DISTRICT	SP	HWY	LOCATION	DESCRIPTION	LENGTH (MI)	LETTING	BID COST	COMMENTS
1	1601-59	61	COOK CTY TO CSAH 1	BIT MILL AND SURFACING, TURN LANES	7.69	11/22/2002	$ 1,224,170	2 YEAR
2	1102-59	2	8.7 MI E OF CSAH 10 TO CSAH 18	BIT MILL AND OVERLAY AND CULVER REPAIR	---	2/28/2003	$ 2,335,249	2 YEAR
2	6803-38	11	TH 89	GRADING, STORM SEWER, BIT PAVING	1.16		$ 3,493,950	GRADING
3	8604-30	25	TH 212 TO N CTY LIMITS	BIT MILL AND SURFACING AND CULVERTS	9.75	5/17/2002	$ 1,593,522	2 YEAR
4	2101-20	27	TH 94 TO TH 29	BIT MILL AND SURFACING, TURN LANES	3.5	7/1/2003	$ 1,246,695	2 YEAR
6	2512-10	60	TH 60 TO TH 52	BIT MILL AND OVERLAY, RT LANES	12.04	4/26/2002	$ 1,107,893	2 YEAR
6	7901-41	42	TH 247 TO TH 61	BIT MILL AND OVERLAY, TURN LANES, CULV	12.42	6/25/2004	$ 2,853,876	2 YEAR
7	0804-73	14	NEW ULM TO TH 15	GRADE, BASE, BIT SURFACING, STORM	2.5	3/26/2004	$ 6,989,888	2 YEAR
8	8827-56	VAR	VAR	BIT ROUTE AND SEAL		4/23/2004	$ 87,511	ROUTE AND SEAL
METRO	1926-17	316	TH 60 TO TH 60	GRADE, BIT SURFACE, LIGHTINTG	9.35	12/19/2003	$ 553,563	2 YEAR
METRO	2744-54	212	CSAH 1 TO I-494 IN EDEN PRAIRE	BIT MILL AND OVERLAY	3.5	6/7/2002	$ 1,527,665	2 YEAR - BIT

Design/Build

DISTRICT	SP	HWY	LOCATION	PROJECT MANAGER	BID COST	COMMENTS
4	1401-150	10/32	INTERCHANGE 10/32	TRUDY KORDOSKY	$ 8,600,000	3-YEAR
6	5502-67	ROC 52	ROCHESTER	TERY WARD	$236,000,000	5-YEAR
7	7408-29	14	CSAH 45 TO TH 218	GARY LOVELACE	$ 10,044,000	5-YEAR
METRO	2735-172	100	DULUTH ST INTERCHANGE	LIZ BENJAMIN	$ 15,400,000	5-YEAR
METRO	2785-304	494	TH 5 TO CARLSON PARKWAY	KEVIN ANDERSON	$135,600,000	3-YEAR
METRO	1017-12	212	12 MI NEW ALIGNMENT	JON CHIGLO	$238,000,000	3-YEAR

APPENDIX A

Appendix B

A+B Project Data

A+B PROJECT SUMMARY

District	SP	Letting	Hwy	RUC	Incentives per Day	Disincentive		ESTIMATED / BID "A" COST	% OVER EST.	BID DAYS DAYS	A+B	ACTUAL DAYS	FINAL COST	FINAL ALLOWED DAY	INCENTIVE DISINCENTIVE	Max Inc. % of Bid	Paid Inc % of Bid	User Savings Savings
2	6001-52	Nov-05	TH 2	3000	$2,000	$3,000				45								
3	1804-48	4/28/2000	TH 169	$ 10,000	None	$10,000	Eng Est	$ 3,166,551		45		27.3	$ 2,805,000	27.3	N/A	N/A	N/A	$180,000
							Bid 1	$ 2,687,805	85%	30	$ 2,790,278							
							Bid 2	$ 2,922,080	92%		$ 2,927,739							
							Bid 3	$ 2,930,188	93%		$ 2,931,214							
3	1809-55	3/14/2003	TH 371	$10,000	$10,000 / MAX 25 DAYS	$10,000	Eng Est	$ 17,436,246		227	$ 19,706,246	170	$ 17,430,000	205	$ 250,000	1.6%	1.6%	$570,000
							Bid 1	$ 15,569,834	89%	202	$ 17,589,834							
							Bid 2	$ 15,602,319	89%	206	$ 17,662,319							
							Bid 3	$ 16,457,663	94%	202	$ 18,477,663							
							Bid 4	$ 17,108,075	98%	227	$ 19,378,075							
							Bid 5	$ 17,431,114	100%	227	$ 19,701,114							
							Bid 6	$ 17,797,742	102%	215	$ 19,947,742							
							Bid 7	$ 17,837,766	102%	227	$ 20,107,766							
							Bid 8	$ 18,200,639	104%	227	$ 20,470,639							
							Bid 9	$ 18,430,000	106%	227	$ 20,700,000							
4	6108-18	3/8/2005	TH 55	$5,000	$5,000 / MAX 20 DAYS	$5,000	Eng Est	$ 4,241,034		50	$ 4,491,034	21		35	$70,000	2.75%	1.93%	$145,000
							Bid 1	$ 3,634,912	86%	25	$ 3,759,912							
							Bid 2	$ 3,708,756	87%	50	$ 3,958,756							
							Bid 3	$ 3,761,981	89%	50	$ 4,011,981							
							Bid 4	$ 5,765,125	136%	50	$ 6,015,125							
6	2480-81	3/29/2002	TH 35	$28,000	$5,000 / MAX 5 DAYS	$28,000	Eng Est	$ 13,014,718		100	$ 15,814,718	99	$ 12,765,293	104	$ 25,000	0.21%	0.21%	$28,000
							Bid 1	$ 12,024,234	92%	95	$ 14,684,234							
							Bid 2	$ 12,875,721	99%	80	$ 15,115,721							
							Bid 3	$ 14,880,436	114%	99	$ 17,652,436							
							Bid 4	$ 15,421,122	118%	100	$ 18,221,122							
6	2481-41	2/23/2001	TH 90	$28,000	NONE	$28,000	Eng Est	$ 8,744,110		95	$ 11,404,110	82	$ 9,441,868	96	N/A	N/A	N/A	$364,000
							Bid 1	$ 8,807,804	101%	92	$ 11,383,804							
							Bid 2	$ 10,628,996	122%									
							Bid 3	$ 12,939,986	148%									
							Bid 4											
6	6680-96	3/26/2004	I-35	$25,000	$5,000 / MAX 5 DAYS	$25,000	Eng Est	$ 8,588,645		100	$ 11,088,645	CLAIM SETTLEMENT						
							Bid 1	$ 8,421,870	98%	85	$ 10,546,870							
							Bid 2	$ 8,592,417	100%	95	$ 10,967,417							
							Bid 3	$ 8,515,957	99%	100	$ 11,015,957							
							Bid 4	$ 8,546,986	100%	100	$ 11,046,986							
							Bid 5	$ 8,589,694	100%	100	$ 11,089,694							
6	2480-99	11/19/2004	I-35	$25,000	NONE	$25,000	Eng Est	$ 12,869,356		100	$ 15,369,356.00				N/A	N/A	N/A	
							Bid 1	$ 13,244,612	103%	95	$ 15,619,612.00							
							Bid 2	$ 13,742,054	107%	100	$ 16,242,054.00							
							Bid 3	$ 16,082,976	125%	97	$ 18,507,976.00							
7	0702-107	4/27/2001	TH 14	$10,000	NONE	$10,000	Eng Est	$7,735,513		130	$ 9,035,513	120.7	$ 9,322,295	122.9	N/A	N/A	N/A	$90,000
							Bid 1	$ 8,342,899	108%	110	$ 8,354,999							
							Bid 2	$ 9,282,318	n/a	n/a								
							Bid 3	$ 9,757,473	n/a	n/a								
7	5380-0112	11/16/2001	TH 90	$10,000	$10,000 / Max 10 Days	$10,000	Eng Est	$ 2,295,366		30	$ 2,595,366	18.3	$ 2,611,486	23	$ 47,000	3.78%	1.94%	$120,000
							Bid 1	$ 2,418,291	105%	23	$ 2,648,291							
							Bid 2	$ 2,626,010	109%	20	$ 2,826,010							
							Bid 3	$ 2,583,797	98%	30	$ 2,883,797							
							Bid 4	$ 2,660,342	103%	30	$ 2,960,342							
							Bid 5	$ 2,679,506	101%	30	$ 2,979,506							
7	1703-0064	3/29/2002	TH 60	$7,000	$7,000 / MAX 10 DAYS	$7,000	Eng Est	$ 2,834,214		40	$ 3,114,214	28	$ 3,021,970	38	$ 70,000.00	2.87%	2.87%	$84,000
							Bid 1	$ 2,440,278	86%	35	$ 2,790,278							
							Bid 2	$ 2,627,739	93%	30	$ 2,927,739							
							Bid 3	$ 2,631,214	93%	30	$ 2,931,214							
7	5202-24	12/19/2003	TH 14	$7,500	NONE	$7,500	Eng Est	$ 2,838,990		33	$ 3,086,490	29	$ 2,320,114	29	N/A	N/A	N/A	$30,000
							Bid 1	$ 2,267,784	80%	29	$ 2,485,283							
							Bid 2	$ 2,384,548	84%	19	$ 2,527,048							
							Bid 3	$ 2,379,205	84%	30	$ 2,604,205							
							Bid 4	$ 2,410,067	85%	30	$ 2,635,067							
							Bid 5	$ 2,477,187	87%	30	$ 2,702,187							
							Bid 6	$ 2,759,540	97%	30	$ 2,984,540							
7	5212-24	1/23/2004	TH 169	$3,100	$3,100	$3,100	Eng Est	$ 2,337,126		40	$2,461,126	27	$ 1,922,843	30	$ 9,300	Unlimited	0.47%	$40,300
							Bid 1	$ 1,983,157	85%	30	$2,076,157							
							Bid 2	$ 2,132,673	91%	25	$2,210,173							
							Bid 3	$ 2,131,437	91%	37	$2,246,137							
							Bid 4	$ 3,017,187	129%	40	$3,141,187							
METRO	2738-20	5/20/2005	TH 101/94	$10,000	$10,000 / MAX 5 DAYS	$10,000 / DAY	Eng Est	$ 618,947		40	$ 1,018,647.00	31	$ 731,500	31	$ 50,000	8.31%	8.31%	
							Bid 1	$ 601,335	97%	31	$ 911,335							
							Bid 2	$ 933,589	151%	30	$ 1,233,589							
METRO	2780-0053	2/22/2002	TH 94	$10,000	$10,000 / MAX 15 DAYS	$10,000	Eng Est	$ 6,697,262		138	$ 8,077,262	129	$ 6,492,485	147	$ 150,000	2.54%	2.54%	$90,000
							Bid 1	$ 5,898,437	88%	130	$ 7,198,437							
							Bid 2	$ 5,898,852	88%	138	$ 7,278,852							
							Bid 3	$ 5,996,912	90%	138	$ 7,376,912							
METRO	0209-22	5/25/2001	TH 169	$10,000	$10,000 / Max 25 Days	$10,000	Eng Est	$ 7,060,119		136	$ 8,420,119	96.6	$ 6,750,820	94.6	-$20,000	3.81%	-0.30%	$390,000
							Bid 1	$ 6,564,693	93%	95	$ 7,514,693							
							Bid 2	$ 6,348,831	90%	135	$ 7,698,831							
							Bid 3	$ 6,549,305	93%	120	$ 7,749,305							
							Bid 4	$ 7,181,238	102%	120	$ 8,381,238							
							Bid 5	$ 7,851,368	111%	136	$ 9,211,368							
NETRO	6280-304	9/23/2005	I-35E	$25,000 (B)	NONE	$30,000 (B)	Eng Est								N/A	N/A		
							Bid 1											
							Bid 2											
							Bid 3											
				$8,700 (C)	NONE	$10,700 (C)	Eng Est	N/A							N/A	N/A		
							Bid 1											
							Bid 2											
							Bid 3											

NOTE: This table has been modified since the 2000-2005 IC draft reort was compiled. Projects let after August 2005 are not included in the IC report.

APPENDIX B

Appendix C

Warranty Project Data

Mn/DOT 2-YEAR BITUMINOUS WARRANTY PROJECTS (DESIGN-BID-BUILD)

District	SP	Letting	Hwy	Years	Low Bid	Length (Miles)	Mix	Qty	Unit		Unit Cost
1	1601-59	11/22/2002	TH 61	2	$ 1,224,170	7.69	***SP 9.5 WEARING (3,B), 5"***	136033	SY	ENG ESTIMATE	$ 3.52
										BIDDER 1	$ 2.20
										BIDDER 2	$ 2.05
										BIDDER 3	$ 2.35
							SP 12.5 WEARING (3,B), 2"	102241	SY	ENG ESTIMATE	$ 4.74
										BIDDER 1	$ 2.80
										BIDDER 2	$ 2.65
										BIDDER 3	$ 3.10
					NON-WARRANTY ITEMS		***Type LV3 WEARING (B) 4"***	1838	SY	ENG ESTIMATE	$ 6.71
										BIDDER 1	$ 22.10
										BIDDER 2	$ 9.20
										BIDDER 3	$ 13.00
							SP 9.5 WEARING (3,B), 1.5"	23968	SY	ENG ESTIMATE	$ 3.42
										BIDDER 1	$ 2.20
										BIDDER 2	$ 2.05
										BIDDER 3	$ 2.20
							SP 12.5 WEARING (3,B), 2"	4113	SY	ENG ESTIMATE	$ 4.64
										BIDDER 1	$ 2.80
										BIDDER 2	$ 2.60
										BIDDER 3	$ 3.10
2	1102-59	2/28/2003	TH 2	2	$ 2,335,249		***SP 12.5 WEARING (4,C), 4"***	274119	SY	ENG ESTIMATE	$ 7.55
										BIDDER 1	$ 5.95
										BIDDER 2	$ 6.28
										BIDDER 3	$ 7.50
					NON-WARRANTY ITEMS		***SP 12.5 WEARING (4,C)***	3938	TON	ENG ESTIMATE	$ 34.15
										BIDDER 1	$ 26.00
										BIDDER 2	$ 28.73
										BIDDER 3	$ 36.50
3	8604-30	5/17/2002	TH 25	2	$ 159,522	9.75	***LV 3 WEARING (B)***	4695	TON	ENG ESTIMATE	$ 28.63
										BIDDER 1	$ 20.70
										BIDDER 2	$ 24.00
										BIDDER 3	$ 22.00
							LV 3 NON-WEARING (B)	4695	TON	ENG ESTIMATE	$ 28.63
										BIDDER 1	$ 19.09
										BIDDER 2	$ 22.50
										BIDDER 3	$ 22.00
							SP 12.5 WEARING (3,B)	20093	TON	ENG ESTIMATE	$ 35.86
										BIDDER 1	$ 24.93
										BIDDER 2	$ 25.00
										BIDDER 3	$ 27.00
					NON-WARRANTY ITEMS		***SP 12.5 WEARING (3,B)***	7852	TON	ENG ESTIMATE	$ 35.50
										BIDDER 1	$ 24.53
										BIDDER 2	$ 27.50
										BIDDER 3	$ 27.00
4	2101-20	7/1/2003	TH 27	2	$ 1,246,695	3.5	***SP 12.5 WEARING (3,B)***	16932	TON	ENG ESTIMATE	$ 28.76
										BIDDER 1	$ 19.21
										BIDDER 2	$ 23.80
										BIDDER 3	$ 32.00
					NON-WARRANTY ITEMS		***SP 12.5 WEARING (3,B)***	593	TON	ENG ESTIMATE	$ 27.26
										BIDDER 1	$ 19.21
										BIDDER 2	$ 23.80
										BIDDER 3	$ 32.00
6	2512-10	4/26/2002	TH 60	2	$ 1,582,589	12.04	***TYPE MV 3 NON-WEARING (B)***	819	TON	ENG ESTIMATE	$ 26.40
										BIDDER 1	$ 29.44
										BIDDER 2	$ 34.91
										BIDDER 3	$ 27.00
							SP 12.5 WEARING (2,B)	38861	TON	ENG ESTIMATE	$ 27.76
										BIDDER 1	$ 20.77
										BIDDER 2	$ 26.40
										BIDDER 3	$ 27.00
							SP 12.5 WEARING (2,E)	1058	TON	ENG ESTIMATE	$ 33.15
										BIDDER 1	$ 24.30
										BIDDER 2	$ 33.23
										BIDDER 3	$ 37.00
6	7901-41	5/18/2004	TH 42	2	$ 2,853,876	12.42	***SP 12.5 WEARING (3,L)***	61358	TON	ENG ESTIMATE	$ 26.75
										BIDDER 1	$ 29.82
7	0804-73	3/26/2004	TH 14	2	$ 6,989,888	2.5	***SP 12.5 WEARING (4,F)***	33228	TON	ENG ESTIMATE	$ 27.23
										BIDDER 1	$ 30.17
										BIDDER 2	$ 33.45
							SP 12.5 WEARING (4,B)	35164	TON	ENG ESTIMATE	$ 22.68
										BIDDER 1	$ 26.08
										BIDDER 2	$ 26.70
METRO	2744-54	6/7/2002	TH 212	2	$ 1,527,666	2.74	***SP 12.5 WEARING (2,B)***	1839	TON	ENG ESTIMATE	$ 70.00
										BIDDER 1	$ 36.15
										BIDDER 2	$ 36.46
										BIDDER 3	$ 35.70
										BIDDER 4	$ 44.00
							SP 12.5 WEARING (4,E)	24468	TON	ENG ESTIMATE	$ 32.00
										BIDDER 1	$ 37.15
										BIDDER 2	$ 38.24
										BIDDER 3	$ 42.90
										BIDDER 4	$ 44.00
METRO	1926-17	12/19/2003	TH 316	2	$ 5,553,562	9.35	***SP 12.5 WEARING (2,B)***	16216		ENG ESTIMATE	$ 28.00
										BIDDER 1	$ 25.75
										BIDDER 2	$ 25.75
										BIDDER 3	$ 29.15
							SP 12.5 WEARING (4,E)	30910		ENG ESTIMATE	$ 32.17
										BIDDER 1	$ 31.00
										BIDDER 2	$ 31.00
										BIDDER 3	$ 34.90
							SP 12.5 NON-WEARING (4,B)	14080		ENG ESTIMATE	$ 28.03
										BIDDER 1	$ 28.00
										BIDDER 2	$ 28.00
										BIDDER 3	$ 32.55
					NON-WARRANTY ITEMS		***SP 12.5 WEARING (2,B)***	6800		ENG ESTIMATE	$ 29.45
										BIDDER 1	$ 33.00
										BIDDER 2	$ 33.00
										BIDDER 3	$ 31.10
							SP 12.5 WEARING (4,E)	3655		ENG ESTIMATE	$ 31.67
										BIDDER 1	$ 35.00
										BIDDER 2	$ 35.00
										BIDDER 3	$ 37.00

Appendix D

Lane Rental Plan Sheet showing lane closure requirements