Lane Rental—Innovative Way to Reduce Road Construction Time

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Abstract: In recent years the public has faced a substantial increase in the number of transportation projects that are being constructed in urban areas under heavy traffic. This type of construction is causing the public major inconvenience, is increasing the number of accidents, and is causing substantial losses to the business community in the affected areas. Because of a perception that contractors focus only on their obligations of meeting budget and schedule considerations under conventional contracting methods and that they do not consider the inconvenience to the public caused by construction work, new contracting methods have been developed that specifically address this problem.

This paper describes a method that has been used in the United Kingdom called lane rental. The lane rental method combines the cost to the using public for the closing of urban traffic routes with the traditional costs of construction. Under this system, contractors are required to consider, and include, both of these costs in the bidding process. The principles of lane rental and the adaptation to the construction industry environment in the United States are discussed in this paper. Two case studies of projects that are bid under lane rental provisions and the lessons that can be learned from those cases are described in this paper.

INTRODUCTION

In recent years, many state highway agencies (SHAs) have seen a shift from constructing new transportation facilities (roads, highways, and bridges) to 3R-type road construction projects. The 3R projects include Restoration, Rehabilitation, and Resurfacing of road facilities. In most cases, the 3R-type projects are constructed in urban areas where the construction process creates major inconvenience to the traveling public and to the business community.

In the past, the major emphasis of most SHAs has been to try to minimize the cost of a project. In today's environment, however, reducing construction time has become an essential element. For example, in replacing the damaged bridges on the Santa Monica Freeway following the earthquake in southern California, the time element was as significant as the cost (the project cost was $15,000,000, the incentive fee for reducing the time was also $15,000,000). To reduce construction time, the Federal Highway Administration and the Transportation Research Board recommended experimenting with innovative ideas that have the potential to reduce construction time ("Innovative" 1991; *Sample* 1991; "New" 1993). To facilitate this process, they also recommended the creation of a National Task Force on this subject (Harp 1990).

One of the major conclusions of this task force was for contracts to be specifically structured to reward contractors by setting a compensatory value on the reduction of construction time (Tarricone 1993). In other words, motivate the contractor to reduce construction time, thus decreasing the inconvenience and cost to the user, by giving him a financial incentive to do it. Three innovative contracting methods were recommended for future evaluation:

- Incentive/disincentive
- Bidding on cost/time
- Lane rental

From the preceding three methods, the first one uses an incentive/disincentive clause that has been under experimentation for a long time. It is a system in which a contractor is motivated to accelerate construction after the bid has been awarded. For each time unit (i.e., hour, day, week) that the contractor finishes the construction ahead of schedule, an incentive fee will be paid, but a penalty will be charged for late finish. This method has been used on numerous occasions; however, there are many practitioners who are not very pleased about past results. The major objective is that it is literally based on the contract time as determined by the owner. Since contract time requirements are, in most cases, determined on the high side as past research has shown (Herbsman and Ellis 1995), contractors are easily able to save some contract time that was generous, if not excessive, from the beginning. The best evidence for this opinion is from research (Herbsman et al. 1994) that showed that in 99% of the projects using an incentive/disincentive clause, the contractors received an incentive fee, and that it has been very rare for anyone to pay a disincentive fee.

The second method, bidding on cost/time, in which contractors bid on the completion time in addition to the cost, has received more support (Ellis, and Herbsman 1990). Although its use is in the very early stages of experimentation, the preliminary results show very good promise (Carr 1994).

The third approach is the most direct one—letting the contractor pay for each time an interference is created with the activities of the traveling public. In other words, if the contractor is closing a lane(s) for work during rush hour or forces the public to make a detour, the cost of the delays and other damages must be paid back to the public by the contractor. The contractor is renting the right to use the lanes from the public, and this is consequently how the name lane rental came about. It must be made clear that there is no free lunch, and the contractor must incorporate the cost of renting the lanes into his cost estimate calculations. The lane rental is a direct payment for each time unit used, so that the contractor will be motivated to reduce the construction time, thus reducing the inconvenience to the public. A good example is a project in Oregon in which the time unit was broken down to intervals of 15 min. In this case, the contractor tried to minimize the lane rental closure and even one-quarter of an hour was significant. For this reason and others, many practitioners feel that the lane rental method has enormous potential in reducing construction time and forcing contractors to use less congested periods in heavily populated areas (the 3R type).

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BASIC PRINCIPLES OF LANE RENTAL METHOD

The first step when using the lane rental method is for the owner to calculate the fee schedule for the lane(s) rental under various time spans. These calculations, by themselves, are not new for many states, and highway agencies have used these calculations in the past as the user cost or road user cost (Herbsman and Ellis 1992). These calculations have also been used by many departments of transportation in comparing various construction alternatives, assessments of liquidation damages, incentive/disincentive fees and when using the bidding on cost/time method.

Although these types of calculations are made in many states, there is no standard uniform calculation method. In most cases, it is based on the cost of delay for the traveling public. These items include the cost of the time (for commercial drivers) and extra mileage (for fuel costs) in a case of detouring; in some states, the cost of inspection, supervision, and other related items are also included. To demonstrate the various approaches in calculating the schedule fee for lane rental, three examples are presented. Table 1 is an example of fee rates for a 1 1/2-mi segment of a four-lane urban freeway while maintaining traffic ("Lane" 1990). These schedule fee rates gave the contractor four options to carry the construction (Table 1, Column 2): (1) Closing one lane during the daytime; (2) closing one lane during the nighttime; (3) closing a lane for the whole weekend; or (4) using a detour. Using these rates, the contractor can decide which of the alternatives is the most efficient for the operation.

Table 2 is an example from a project in the United Kingdom that allocated different rates to specific parts of the road (Bundar 1988).

Table 3 lists fee rates suggested by the Federal Highway Administration (*Sample* 1991), and these are divided into three time spans. In Table 3, the first rates (Column 2) are the recommended daily rates for closing one lane. The next two columns show hourly lane rental fees for rush hours (Column 3) and nonrush hours (Column 4).

TABLE 1. Schedule of Lane Closure Fees

Work time (1)	Work duration (2)	Lane closure fee (3)
Weekdays	9 a.m. to 3 p.m.	$6,000/day for each lane closed
	6 p.m. to 6 a.m.	$1,000/day for each lane closed
Weekends	Friday 6 p.m. to Monday 6 a.m.	$10,000 for each lane closed
	Friday 6 p.m. to Monday 6 a.m.	$50,000 for whole project detour

Note: From "Lane" (1990).

TABLE 2. Example of Lane Rental Charges as Used by BDTp for 4-Lane Project

Type (1)	Lane rental fee (dollars/day)[a] (2)
Type A only	1,500
Types A and B only	13,500
Types A or B and C or D only	27,000
Type D only	6,750

Note: Type A = hard shoulders; Type B = left-hand lane; Type C = center lane; and Type D = right-hand lane.
[a]Originally in British pounds (£) converted here to U.S. dollars ($): £1 = $1.50.

TABLE 3. Example of Lane Rental Fee

Lane type (1)	Daily fees (dollars/day) (2)	Hourly fees (6:30 a.m.–9:00 a.m.) (dollars/h) (3)	Hourly fees (3:00 p.m.–6:00 p.m.) (dollars/h) (4)
One lane	20,000	2,000	500
One shoulder	5,000	500	125
One lane and shoulder	25,500	2,500	625
Two lanes	45,000	4,500	1,250
Two lanes and shoulder	50,000	5,000	1,375

Note: From *Sample* (1991).

Each organization determines their preferred method of calculation for a lane rental fee and incorporates these rates in the bid documents, so that every participant in the bidding process will be using the same rates in their cost-estimating calculations. After receiving the bid documents, each contractor must determine the optional method (as related to lane closure) for performing the construction. This decision is based on economic considerations and is a compromise between the contractor's preferred method of construction and the cost involved. For example, using Table 1 data, many contractors would prefer a weekend detour solution that would enable them to work on all lanes with minimum interference. The contractor, however, must also evaluate the cost involved, which is $50,000 that must be paid to the owner.

After making his work schedule decision, the contractor will incorporate the cost involved in lane closure into his cost estimate. For example, if the contractor chose to close one lane plus the shoulder during the daytime (nonrush hours), the number of estimated hours would have to be multiplied by $625/h (using Table 3 data). If the contractor worked for 10 h a day for 15 days, the total cost would be 15 days × 10 h × $625/h = $93,350. This would have to be added to the cost estimate of the work items.

When a contractor is awarded the bid, $625/h would have to be paid each time that a lane was closed. If the lane was closed for >15 days, the contractor might lose money because this additional cost was not included in the original estimate. On the other hand, the contractor would have the economic motivation to reduce the number of hours that a lane was closed and, therefore, minimize the inconvenience to the traveling public and gain more profit.

Using these basic principles, some variations of the lane rental method were originated in the United Kingdom and are presented next (Maggs 1985; Joint Working Group 1989).

LANE-BY-LANE RENTAL

In this variation, the contractor will be charged for each time lanes were closed based on the predetermined fees that were part of the bidding documents. The time interval can be weeks, days, hours, or even smaller intervals. For example, the Oregon Department of Transportation (DOT) had a project in which the contractor was charged for every 15 min they had the lane closed. The selection of the contractor is based on the lowest overall cost on work items (as in any other conventional bid). The contractor must determine the future cost for lane closure and incorporate it into his/her cost estimate. This was the only version of the lane rental contracting method that was used for those projects included in this study. As reported by U.S. contractors, the lane-by-lane rental variation will be the most easily adapted for contractors when compared to traditional U.S. contracting methods and procedures.

CONTINUOUS SITE RENTAL

The British Department of Transportation (BDTp) has used another version of lane rental called continuous site rental. In this version, the contractor is charged a daily rental fee for each day that the lane is occupied. The charge will then be applied for the whole construction time. The lowest bidder is selected by the lowest responsible bid amount for work items included in the contract. Although this version has its advantages, mainly reducing overall construction time, it has caused some concerns. Clark (1992) raised the question of the con-

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tractor's cash flow. In the early stages of the contract, fees may exceed the contractor's payments, and this could cause unbalanced bids. Another problem is payment for days of bad weather, which raises the question of how to define adverse weather conditions. Most U.S. practitioners who have been interviewed do not consider this version to be applicable to U.S. conditions because of the subjective nature of the variables involved.

BONUS/RENTAL CHARGE METHOD

The original form of lane rental in the United Kingdom was the bonus/rental charge. In this version, the bidding contractor estimates the time needed for lane(s) closure and includes this cost (based on lane rental fees) into the bid. The lowest bidder is determined by the lowest combination of the cost of work items plus the cost of lane rental (see Table 4).

Analyzing Table 4 shows that although Bidder B was the second lowest in the cost ranking (Column 2), B's bid on the lane closure time was the lowest one (Column 3). The lowest combined bidder was Bidder B with the cost of £1,597,000 (Column 5) as compared to Bidder C with a combined bid of £1,642,000. Analyzing the results shows that the BDTp will pay £4,000 more (the difference in cost between Bidders A and B); however, the net gain for the public will be 14 days less of closure lanes (the difference between 60 and 46 days). This time savings has the value of 14 days × £14,000/day = £169,000. The net gain for the public will therefore be £165,000, which is the difference between Bidders B and C (£169,000 − £4,000 = £165,000).

Should the contractor overrun the time estimate, the rental fee will be deducted, or charged to the contractor, and, if ahead of schedule, a bonus (incentive) is received for work completed early. This version of lane rental practiced in the United States as bidding on cost/time (Ellis and Herbsman 1990) has evolved into a contract type separate from lane rental now known as the A + B method (Herbsman et al. 1995). The A + B method was successfully tested on over 100 projects. The writers and others do not consider this version to be a pure lane rental method, and it is still basically bidding on cost/time yet with another name.

EXPERIENCE GAINED BY BDTp

Analyzing the BDTp's experience in using the lane rental method is very important because the United Kingdom was the first to directly implement this new method on capital projects. The BDTp produced valuable data from which U.S. practitioners can benefit from their colleagues' experience.

The interested reader can find more information on the BDTp's experience by consulting these references (Srinivasan and Harris 1991; Gay 1992; Arudi et al. 1995). The BDTp started using the lane rental in 1984 and was using all three versions (bonus/charge, continuous rental, and lane-by-lane rental). The following items are the major conclusions from the BDTp's experience.

TABLE 4. Bid Calculation Using the Bonus/Rental Change[a]

Contractor (1)	Cost part (£) (2)	Day bid (3)	Lane rental cost (£)[b] (4)	Combined bid (£) (5)
A	1,593,000[c]	60	196,000	1,789,000
B	1,597,000	46[d]	0.00	1,597,000[e]
C	1,600,000	49	42,000	1,642,000
D	1,698,000	65	203,000	1,901,000
E	1,720,000	70	336,000	2,056,000

[a]Rental fee = £14,000/day.
[b]Number of lane rental days minus 46 days × £14,000.
[c]Lowest bidder on cost part.
[d]Lowest bidder on time.
[e]Lowest combined bidder who was awarded bid.

Savings in Cost and Time

Bundar (1988) analyzed the extensive experience of the BDTp in the 1980s. Bundar's evaluation was done by comparing the owner's cost and time estimate (known in the United States as the engineer's cost and time estimate) to the resulting project cost using the lane rental method. The first results of Bundar's research is related to the bonus/charge version. The results of analyzing four projects show a savings of 25% in time (84 days) and over £1,000,000 ($1,500,000) in costs. Analyzing 12 more contracts in 1985/1986 showed a savings of 38% in time (499 fewer days of delays and maintenance of traffic) and the related cost savings.

The BDTp estimates that on a total of 31 projects built in the 1980s, the savings were £23,000,000 ($34,500,000). The owner paid £2,700,000 ($4,000,000) in bonuses, so that the net gain to the public was £20,300,000 ($35,000,000). These results are very impressive.

On an original budget of £87,700,000, the BDTp saved £20,300,000, which is a 23% savings. The total time saved on these 31 projects was 1,419 days, which meant 1,419 days less inconvenience to the public.

Manpower

Projects that are conducted using lane rental put a lot of pressure on the resources of all parties involved, especially when the fee rates are high (in the range of thousands of dollars a day). Shift work during the day or night, and a 24-h work day, can create problems of fatigue in the workman and has the potential for creating adverse conditions affecting production and safety on the job. These problems dealing with project personnel must be addressed and dealt with in advance, and the BDTp's experience shows that manpower issues can be handled successfully if there is attention to the human aspect of the project.

Management Decision

"The use of lane rental requires decision-making accuracy and in-depth knowledge of the contract documents" (Bundar 1988). Contractors can expect to get a quick response to their traffic control initiatives and the owner's staff can expect to be notified of any problem on the job.

Contract documents should be clearly defined including a very detailed work plan for maintaining traffic.

Quality of Work

The BDTp's conclusion is that the quality of the final product has been as good as in any conventional project. A major concern of contractors for night-shift work is the supply of materials, particularly concrete, asphalt, and aggregates, since many suppliers do not normally operate at night and to do so they will require a surcharge on their services for this inconvenience. These problems can be solved by a good management team, but one cannot underestimate problems that can make prices go up when there is a limited number of suppliers in a specific area; this will cause prices to go up according to the law of supply-and-demand.

Lane Rental Fees

The BDTp experience shows that there is no direct correlation between size of the lane rental fees and the timesavings. Other factors, such as the nature of the work, location, weather, and traffic volume, have a greater effect on the time-

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savings. However, most contractors admitted that if the lane rental fee is too small (in the range of hundreds of dollars per day), it has little effect on their decision on which lanes to close and how long to keep them closed.

The BDTp's experience using lane rental in 31 projects shows that the average daily lane rental fee was around £8,500/day ($12,750/day), the highest rate was £40,000/day ($60,000/day), and the lowest one was £1,000/day ($1,500/day). Thus, the median differs from the mean indicating that a small percentage of highly congested urban projects results in disproportionately high lane rental cost.

Overall Evaluation of BDTp

All parties involved have been enthusiastic about the lane rental method. This method favors more efficient contractors, so that those firms who were able to give careful thought to planning the work were very satisfied from using lane rental contracts. "Some contractors have even suggested that lane rental has improved efficiency within their own organization in terms of resource planning and the use of equipment" (Bundar 1988).

U.S. EXPERIENCE

The lane rental method has been tested on a very limited basis in the United States. As of March 1995, there have been only a few states that have used it on selected projects (<10). Among the states that experimented with this method are North Carolina, Colorado, Oklahoma, Oregon, Washington, and Maryland. The projects in which lane rental was used include the following:

1. Improvement of an intersection in Denver, Colo.—lane rental fee = $2,850/day.
2. Reconstruction of a highway interchange in Oklahoma City, Okla.—lane rental fee = $5,000/day.
3. Two major reconstruction jobs in Portland, Ore.—lane rental rate fee variable up to $21,000/day.
4. Work on Road SR-99 in Washington—lane rental fee = $7,000 for ½ day, and $15,000/day for a full day.
5. A Maryland project on I-95/I-495 near Washington, D.C.—lane rental fees not available.

Analysis of Case Studies

Case Study No. 1

Project: Improvement of Sheridan Boulevard in Denver, Colorado

Date: Fall 1993

Project description: "This project is located in the southwest area of Denver in an established residential and retail commercial center. Hampden is a main arterial on the south side of Denver running in an east and west direction. Sheridan, the other main arterial in this area, is a north/south street running under Hampden.

The purpose of this project is to rebuild the Sheridan Interchange to current standards and replace the structurally deficient bridges over Bear Creek and Sheridan Boulevard.

Sheridan is a four-lane highway, with additional turning lanes as required. The heavy impact on traffic is in the a.m. and p.m. hours when people are leaving for and returning from work. During Phases 8 and 9 of this project, the construction on Sheridan requires the contractor to raise the profile grade (5 ft over a 1,000-ft section). Because of this work, Sheridan, for a period of time, will be restricted to only one lane of traffic in each direction." (From the project manager's report)

Colorado DOT's Reason for Using Lane Rental. The Colorado DOT selected the lane rental method since this project was to be constructed in a heavily populated area with no detouring suitable to handle the traffic. It was felt that lane rental would provide the contractor an incentive to complete work quickly to reduce the construction inconvenience impact on the traveling public.

Lane Rental Fee. The lane rental fee was calculated as a road user cost for closing one lane. The data for this calculation came from a traffic survey in the area before construction and during construction. Fig. 1 is an example of the lane rental fee as calculated by the Colorado DOT.

Work Progress. The lane rental started after midnight September 10, 1993, and was scheduled to last 3 days. This schedule would have been met had a 5-in. snowstorm not developed. The storm caused the contractor to go into one additional day of lane rental. The contractor was charged a total of 4 days at $2,850/day (three working days and one hampered by weather).

The contractor planned his work well. Working with the engineers on the project, an hour-by-hour flow chart was developed for all activities. The chart included each activity, the hours needed to complete the task, the people involved, what shift they would be working, and whether the contractor or a subcontractor was doing the work. The chart also included the name of the responsible charge during all phases of the operation. At the time of the weather shutdown on the third day, the contractor had been on schedule. The contractor shut down due to the weather conditions and concerns for safety to the traveling public. Showers had been predicted but not the 1.2 in. of rain (including 5 in. of snow) that collected on the project site.

Contract Documents. Fig. 2 portrays the section of the bid documents for this project, which defined the lane rental specifications.

Conclusions of Colorado DOT from In-House Report by M. W. Goff (October 1994). The owner was satisfied with the results since the inconvenience to the traveling public was reduced. This opinion is supported by the fact that the Colorado DOT received only two complaints from the public, which is far fewer than the number received on a similar project contracted with no lane rental closure. The Colorado DOT resident engineer cautions that "this tool [lane rental] must be used correctly. . . . [and] a lot of forethought should be given to the use of lane rental before it becomes part of the plans."

Items to Be Considered when Using Lane Rental. To ensure success, the following items from the Colorado DOT's experience should be considered very carefully before lane rental is included in road construction plans:

- All work items must be very clearly defined and shown on the plans at the time the contractor bids on the project. Also, the specifications need to clearly define when the rental time will start and when it will be stopped.
- Are there other preferred alternatives for traffic maintenance to consider?
- Should night work be mandatory, allowable, or disallowed?
- Should weekend work be mandatory, allowable or disallowed?
- What impacts will night work have on residents in the area (e.g., noise)?
- Are all utilities and other possible conflicts shown clearly on the plans?
- Traffic control plans at intersections within the lane must be defined.
- Additional personnel to be needed during this operation must be considered.

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Delay and Cost Analysis

Kenyon Avenue

Delay for existing conditions = 18.9 sec./veh.
Delay for construction = 60.0 sec./veh.

Difference in delay = 60.0 - 18.9 = 41.1 sec./veh. = 0.11 hours/veh.

Bear Valley

Delay for existing conditions = 15.5 sec./veh.
Delay for construction = 60.0 sec./veh.

Difference in delay = 60.0 - 15.5 = 44.5 sec./veh. = .012 hours/veh.

Average cost per hour delay for cars = \$ 6.25
Average cost per hour delay for trucks = \$17.80

Total ADT 38,600 with 4% trucks or 37,056 cars and 1,544 trucks.

Kenyon Avenue

37,056 cars/day * 0.011 hours/veh. * \$6.25/hour = \$2,544/day
1,544 trucks/day * .011 hours/veh. * \$17.80/hour = 303/day
TOTAL \$2,847/day

Bear Valley

37,057 cars/day * .012 hours/veh. * \$6.25/hour = \$2,779/day
1,544 trucks/day * .012 hours/veh. * \$17.80/hour = 330/day
TOTAL \$3,109/day

FINAL LANE RENTAL COST = \$2,847/day

FIG. 1. Calculation of Lane Rental Fee by Colorado DOT

Maintaining Traffic

The Contractor shall pay a daily lane rental fee for the lane closures on Sheridan Boulevard during the construction of the new typical section of Sheridan Boulevard as depicted in Phases 8 and 9 of the plans. This fee will be assessed for each calendar day or portion thereof that the traffic in either direction is limited to one lane of travel. The Contractor shall maintain one lane of traffic in each direction at all times. The Engineer may not charge the fee for lane closure days for additional work not covered in the scope of this project, or for any work stoppage or extenuating circumstances, excluding weather. No lane rental fee will be charged for each weather day after the second (2nd) consecutive weather day.

The lane rental fee will be deducted from any monies due the Contractor for work performed. The deduction will be based on the applicable rate for any and all closures whether work is performed or not. This deduction will be reflected in each progress payment. This deduction is not a penalty but is a rental fee based upon road user cost to occupy lanes on Sheridan Boulevard.

The Lane Rental Fee for Sheridan Boulevard shall be \$2,850.00 per day.

FIG. 2. Subsection of Lane Rental Included in Colorado DOT Project Bid Documents

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- Can the quality of certain items be relaxed and, therefore, be considered for scheduling for completion as night work?
- At what point should weather be a factor, and who is empowered to authorize suspension of the work? Safety to the traveling public should have precedence over getting the work completed.

It is very interesting to note that the Colorado DOT's experience and comments are very similar to the conclusions of the BDTp practitioners.

Comments by Contractor. The contractor that was working on the project in Denver had a few conclusions of his own:

> "Coordination was the key. I had seven pages of schedule with subcontractors' times and details, along with full traffic control elements, starting on weekend with lighter traffic volume helped and we wanted to see what dirt and fill and paving could be accomplished Saturday, Sunday, and Monday.

Case Study No. 2

Project: Improvement of section of I-40 in Buncumbe County, near Asheville, N.C.

Date: November 1992

Project Description: The removal and replacement of deteriorated concrete pavement in the eastbound lanes of Interstate 40 near Asheville.

General Description. The North Carolina DOT tried to use the lane rental method in this project. The work required that the traffic be detoured a total distance of 10 km (6 mi).

Lane Rental Fee. Using the University of Texas model, the North Carolina DOT estimated the cost of delays for the traveling public to be approximately $43,000/day. For internal reasons, the department decided to limit the lane rental fee to $15,000/day. The maximum time allowed for the lane to be closed was assigned as 43 days.

Bid Results. Only two bidders participated in the bidding process. Table 5 is the bid tabulation that also included the department's estimate on cost and time. Analyzing the results shows that both of the contractors' estimates were above the North Carolina DOT's estimate on time and cost. The proportion of the lane rental fees ($525,000) was very high compared to the cost part ($290,000). Therefore, the state decided to cancel the bid due to lack of response and went to the other option of conventional bidding plus the incentive/disincentive clause. This case study is the best example that illustrates why the lane rental method must be used with caution. The practitioners that were interviewed for this case study saw the lack of preliminary information on the lane rental procedure and its potential adverse consequences as the main cause for the low response of only two bidders, which ended in a cancellation of the bid.

TABLE 5. Bid Tabulation

Number (1)	Bidder (2)	Cost estimate[a] (dollars) (3)	Cost estimate[b] (dollars) (4)	Time bid (days) (5)
1	A	817,359	292,359	35
2	B	818,992	293,992	35
3	NCDOT[c]	469,638	229,638	16

[a]Total cost estimate including lane rental fee.
[b]Cost estimate without lane rental fee.
[c]North Carolina DOT's in-house estimate.

CONCLUSIONS

The lane rental method has the potential of being a major tool in reducing construction time. Its major impact will be on projects built under heavy traffic volumes.

The experience of the BDTp and the few SHAs that have tried lane rental in the United States shows clearly that it can reduce construction time substantially if the right procedures are followed. Most practitioners in the United States agree that only the lane-by-lane rental version will fit in with the U.S. construction tradition and procedures. It is very interesting to observe that the experience of the BDTp practitioners on the use of lane rental is very similar to the conclusions of the U.S. practitioners.

One of the major conclusions is that because the use of the lane rental method is very intensive, it demands very careful development in the early stages. This development includes preparing and documenting plans for maintenance of traffic under various options and carefully calculating the lane rental fee schedule. Developing plans for a lane rental project can be facilitated through use of documents such as *Sample Special Provisions for Lane Rental,* which is provided in Appendix I (*Sample* 1991).

Another conclusion of almost everyone involved in the use of lane rental is that a lot of emphasis must be given to the human aspect of managing the project (contractors, inspectors, operators, etc.).

RECOMMENDATIONS

The following two main recommendations are indicated from this study:

- More research must be conducted by transportation agencies to determine standard procedures for calculating lane rental fees (user costs). One of the most important aspects to be researched is how and whether to include costs such as damages to the business community around the construction site.
- The experience gathered from projects done in the United States and other countries using lane rental must be compiled and disseminated among all interested agencies in the United States. This information can be compiled in a national database as more projects are constructed in the future.

APPENDIX I. LANE RENTAL EXAMPLE SPECIFICATION [SAMPLE SPECIAL PROVISION (*Sample* 1991)]

Lane Rental for Construction—Hourly Basis

A. GENERAL

Monetary assessments will be made against the contractor for each hour there are restrictions or a reduction in the number of available travel lanes or shoulder width.

B. DEFINITION OF TERMS

For this contract the following definitions apply:

(a) *Calendar Day*—Any day on the calendar including Saturdays, Sundays, and legal holidays, beginning and ending at midnight.

(b) *Hour*—Any continuous 60-min period or portion of a continuous 60-min period beginning at that point when a lane and/or shoulder is closed or obstructed by the contractor's operation.

(c) *Rental Charge*—The amount, as shown in the proposal, that represents the average hourly cost of interference and inconvenience to the road user for each lane and/ or shoulder closure or obstruction.

(d) *Obstruction*—When the contractor's operations have

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resulted in the usable lane width of the travelway or shoulder to be less than that specified in the plan documents.

C. LANE RENTAL

This contract includes a lane rental procedure under which the contractor is assessed a rental charge for each line and/or shoulder closure or obstruction from the time of Notice to Proceed until such time that the project is complete.

One lane of the roadway shall remain open for each direction of traffic at all times. The rental charge to be assessed for each lane and/or shoulder closure or obstruction per direction of traffic per hour[1] is as follows:

Closure and/or obstruction	Hourly[2] rental charge ($) 6:30–9:00 a.m. 3:00–6:00 p.m.	Hourly[2] rental charge ($) All other hours of day
One lane	2,000	500
One shoulder	500	125
One lane and shoulder	2,500	625
Two lanes	4,500	1,250
Two lanes and shoulder	5,000	1,375

The applicable lane rental charges will be deducted from any monies due the contractor for work performed. The deduction will be made based on the applicable rate for any and all closures whether or not work is being performed. This deduction will be done on each progress payment.

D. FAILURE TO COMPLETE WORK ON TIME

All contractor work shall be completed by ________.[3] For each calendar day that any contract work remains uncompleted after the contract time prescribed for the completion of all work, $________[4] will be deducted from any money due the contractor, not as a penalty, but as liquidated damages.

On those days when the contractor is to be charged the liquidated damages fee, but the contractor has closed or obstructed a lane and/or shoulder, the contractor will be charged the greater amount—either the appropriate lane rent or the liquidated damages fee indicated.

This assessment will be deducted from any monies due or to become due the contractor.

Notes

[1]In some unusual situations, where opening the roadway to traffic is extremely critical, having rental rates for portions of an hour, such as 15-min increments, may be considered.

[2]This sample specification has been written in a manner such that rent is to be charged for every hour a lane and/or shoulder is closed or obstructed, with any portion of an hour treated as a whole hour. The rental rates are included as examples only. Rental rates need to be determined for each project based on actual user costs for that project.

[3]A maximum number of calendar days should be specified to encourage the contractor to complete the project as early as possible.

[4]The liquidated damages rate should be based on construction engineering inspection costs and, in cases where there is a public need, may also include road user costs. Because construction engineering inspection costs and road user costs are also included in setting lane rental rates, in the administration of contracts that include both lane rental and liquidated damages, the contracting agency must be sure that the contractor is not charged twice (both as rent of a lane or shoulder and also as a liquidated damage) for the same cost being incurred, be it construction engineering inspection or road user costs.

FHA/HNG-22/S.J.GAJ
November 15, 1991

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