



Alternative Contracting and Innovative Construction Guide

Design Build

A + B

Lane Rental

Incentive / Disincentive

Warranties

Innovative Construction

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Introduction

The Montana Department of Transportation's Work Zone and Mobility Policy states that MDT will manage construction zone impacts by using various management strategies. Appendix H of the Policy lists many of the strategies that are available and categorizes them. These guidelines are intended to aid the project developer in selecting the appropriate *contracting and innovative construction strategies* for use on "significant projects" that most likely would result in a reduction of construction related impacts. ("Significant projects" are defined in the Policy.)

The Federal Highway Administration (FHWA) has approved several *contracting* strategies for use on federally funded projects that differ from the traditional design-bid-build process. Each feature is used to achieve certain results. For example, Design Build is used for rapid completion of the overall project design and construction. Lane Rental clauses minimize traffic disruption. A+B Bidding and Incentive/Disincentive minimize construction time.

In addition, the project *design* can incorporate features such as precast components or rapid cure materials that can result in reduction in construction time.

Generally, use of the strategies can be expected to increase construction cost. The benefits though are reduced impacts and potentially reduced Construction Engineering costs. In some cases, a project's duration can be shortened to allow completion in one season, thus also avoiding the costs of winter shutdown and maintenance.

Definitions

- ⚡ **Design Bid Build-** The traditional contract delivery method in which a project is designed and then advertised for bid. The contract is awarded to the lowest responsive and responsible bidder.
- ⚡ **Design Build-** An alternative contract delivery method where one entity performs the design and construction of a project thus reducing project duration by allowing construction to begin prior to completion of the design.
- ⚡ **A+B Bid-** This strategy encourages contractors to minimize construction impacts by reducing construction time. Part A refers to the contractor's bid amount for items of work and Part B relates to the total number of days bid to complete the project. Contract award is based on the lowest combination of A and B.
- ⚡ **Lane Rental-** Lane Rental contract clauses encourage Contractors to plan construction in such a way as to minimize traffic disruption. The Contractor is assessed a rental fee for occupying shoulders or lanes to perform contract work.
- ⚡ **Incentive/Disincentive-** This strategy reduces construction time by providing a monetary bonus for early completion or a penalty for late completion of the project or some part of the project.
- ⚡ **Warranty-** Warranties in highway construction are defined as a guarantee of the integrity of a product and make the contractor responsible for repair or replacement of deficiencies. The goal of a warranty in highway construction is to effectively transfer any risks controlled by the contractor to the contractor.
- ⚡ **Innovative Construction-** Involves the use of special materials and/or methods such as quick curing concrete, precast elements, and adjacent fabrication/relocation to minimize the duration of traffic impacts.

Design Build

Description

Design Build combines into a single contract the design, construction and in some cases, construction engineering and inspection.

MDT will provide a Request for Proposal package that contains the design and construction information necessary to guide a prospective firm in the preparation and submission of a proposal. In Adjusted Score Design Build (ASDB), the contract is awarded based on an evaluation of the Bid Price Proposal and the Technical Proposal score. See the MDT Design Build Guidelines for more information on the process.

Considerations

Benefits for Design Build:

- Construction can begin prior to completion of the design, resulting in a shortened overall completion time.
- Conflicts arising from a difference in design and actual conditions are reduced or eliminated.
- Reduced risk of claims.
- Promotes innovation.

Projects having the following characteristics may be good candidates for design build: (some or all may apply)

- Emergency project.
- Limited time constraints.
- Clearly defined scope and design basis, expressed in terms of performance requirements.
- Ideally, right of way, hazardous materials and environmental issues are clearly identified.
- Completed National Environmental Policy Act (NEPA) process.
- A unique or special project that requires expertise not available in-house.

A+B

Description

This strategy encourages contractors to minimize construction impacts by reducing construction time. Part A refers to the contractor's bid for items of work. Part B is the value of the total number of days bid to complete the project times the daily User Cost. The contract is awarded to the bidder having lowest result of:

$$A + (n \times \text{User cost})$$

where $n = \#$ of days bid

The contractor's payment is based on both Part A and the actual number of days used under part B. A+B is often used in combination with Incentive/Disincentive clauses.

Considerations

A+B does not reduce the degree of traffic impact other than shortening the number of days that impacts are present. This strategy is suited for projects where it is desirable to complete the work, or a critical portion of the work, in a short time.

When considering the use of an A+B bid contract, the risk of delays due to reasons beyond the control of the Contractor must be evaluated. These types of delays can negate the benefit of using A+B and be a source of increased cost. Assess the potential risk for delay arising from the following:

- Utility, Right of Way, or Rail-Road conflicts that may not be addressed in the contract.
- Change Orders from design changes or geotechnical uncertainties.
- Risk of delay from hazardous, environmental or archaeological issues.
- Third party agreements.

Projects susceptible to these types of delays may still be suitable for A+B bid, but the contract will have to contain provisions to address them specifically.

Since A+B is usually used along with an Incentive/Disincentive clause, it should also be noted that FHWA Technical Advisory 5080.10 recommends a Critical Path Method Schedule be required whenever a completion date is reinforced by an I/D clause.

Lane Rental

Description

Lane Rental clauses reduce traffic impacts by encouraging the minimization of the closure time for lanes or shoulders or by encouraging that the closures take place during non-peak traffic times. In effect, the Contractor is charged “rent” for time that lanes or shoulders are occupied.

The contract will contain a schedule of “rental” rates that define the user cost associated with each lane or shoulder closure for both peak and non-peak traffic times.

Bidders will have to estimate the number and durations of closures that will be needed to complete the work. Based on this and the schedule of rates, the bidder will calculate an anticipated total user cost that will result from the construction work. The contract is awarded to the qualified bidder having the lowest total for bid item amount plus anticipated total user cost.

During construction, the actual closure times are monitored and the resulting actual user costs are tabulated. At the end of construction, the actual total user cost is summed and compared with the original amount for user cost. If the actual total user cost is less than the original amount, then the contractor will receive a bonus payment equal to the difference. In the event that the actual total user costs exceeded the original amount, the difference will be deducted from the monies owed to the Contractor.

Considerations

Lane Rental works best for short duration operations where a lane or shoulder can be closed for a few hours during non-peak traffic flow times, and reopened during times of peak flow. Closures during peak flow may also be permissible but would have a high rental rate.

Up to date hourly traffic count data and accident data will be needed for lane rental rate determination. Basically, rental rates are calculated by:

1. Estimating capacity of the facility under normal conditions for a particular time (peak or off peak).
2. Estimating the capacity of the facility during the closure condition.
3. Determination of delay, in terms of vehicle hours, and the corresponding user cost that result from the closure.

In some cases, the calculated amount for user cost may be unacceptably high. In these cases use of a reduced amount would be justifiable.

At no time should safety be compromised. The contract must specifically address when or under what conditions lane or shoulder closures would be required.

Determination of contract time is another important consideration. A Lane Rental contract would be expected to have more working days available than a traditional contract of the same magnitude and scope. Since the intent of Lane Rental is to encourage work to be completed during low traffic times, it is likely more days would be needed.

Lane Rental would not be advantageous for:

- Long term projects where it would be difficult for a Contractor to predict the duration of activities that would impact a lane
- Detour projects (consider A+B)
- Projects with third party conflicts such as Utilities

Incentive/Disincentive

Description

Incentive/Disincentive is used to shorten the duration of traffic impacts. It typically provides a bonus for completing construction or a construction milestone early and a pay deduction for being late.

Incentive/Disincentive has been applied to both short term and long term work. For example, on the Minesinger Trail to MT 35 project, an incentive of \$4800 per day was available for each day work was completed early, as well as a disincentive of the same value for every day the project was late. Another project, the Richmond-San Rafael Toll Bridge (in California) only allowed night work and had provisions for a \$25,000 per *minute* penalty for late opening each morning.

The amount of the incentive/disincentive is typically less than or equal to the associated road user cost.

Considerations

Incentive/Disincentive clauses reward the early completion of some objective. Examples of the objective could include: opening up a certain number of lanes, opening a structure to traffic, or completion of the entire project. The contract must clearly define what constitutes *completion* of the objective, so that there will be no disagreement as to the *time* at which the objective was completed.

As with other methods of accelerating construction, costs can be expected to be higher for Incentive/Disincentive contracts.

Time adjustments from Change Orders or delays can become a major source of dispute on projects having Incentive/Disincentive. Critical Path Method Scheduling should be a contract requirement and will facilitate the determination of any time adjustments. The Contract should provide for time adjustment only for cases where the critical path was impacted. There should also be a requirement that any requests for time extension are initiated in a timely fashion in order for MDT to have an opportunity to mitigate the effects to the Incentive/Disincentive.

In some cases, the calculated road user cost may not be large enough to provide a substantial incentive to accomplish the objective. In these cases, it may be necessary to shift other cost increases to the Contractor. For example, a contract may have an Incentive/Disincentive for completion of work by a particular calendar date. If the Contractor is late and does not meet the date, there could be a requirement for the Contractor to be responsible for all traffic control costs after the date in addition to the prescribed Disincentive.

Warranties

Description

Warranties are generally categorized as either Performance or Workmanship type. Product or manufacturer warranties may apply to individual contract items such as traffic signal hardware, landscaping items, irrigation systems, etc. MDT's current Seal Coat Specification (Section 409) includes workmanship type warranty requirements. For this work, warranty considerations include; longitudinal joint location, transverse joint smoothness, and final appearance criteria related to chip loss, flushing, tracking and bleeding conditions. An example of a performance type warranty for seal coat work would base acceptance of the final product on measured skid resistance.

Whichever type warranty is utilized, the provisions of the contract must clearly identify acceptance criteria. When administering workmanship or performance type warranties, the contract remains open through the duration of the specified warranty period and until all associated requirements are satisfied.

As noted above, specific contract items may have product or manufacturer warranties. In those cases contract provisions typically require warranty information be provided to the Project Manager. If a failure occurs while the contract is active, the Department will have the Contractor perform warranty repairs. Warranty repairs required after the contract has been closed are typically administered by MDT Maintenance personnel.

Considerations

The goal of a warranty in highway construction is to effectively transfer any risks controlled by the contractor to the contractor. The length of the warranty period requires careful consideration. Warranties extending beyond one year may have significant impacts on a contractor's ability to obtain bonding. Montana has a relatively small contracting community therefore, limiting a contractor's ability to obtain bonding results in reduced bidding competition and higher project cost.

Agencies that extend warranties beyond one year generally require a separate warranty bond. This bond provides the assurance that the materials and workmanship of the contractor will not fail soon after project completion and acceptance. For example Ohio's seal coat warranty requires the contractor provide a 75 percent maintenance bond for a 2-year period.

For more information, see results of recent NCHRP project:

<http://www.traunerconsulting.com/nchrp-pw/background.html>

Innovative Construction

Description

Innovative Construction involves the use of special materials or techniques that reduce construction time. These practices can either shorten overall construction time or make it possible to do the work during short term closures during off-peak traffic times.

As this is a rapidly evolving area, newly emerging techniques and materials are continuously being developed. The designer should research the latest information on current practice as well as strive to create innovative design elements that could result in acceleration of the project.

As these methods and materials become better known and the real monetary value of shortening construction time increases, it is likely that contractors will increasingly utilize Value Engineering as a means to propose and incorporate these practices into projects. Obviously, it is preferable to initiate accelerated construction methods in the pre-construction phase of project development.

Considerations

A typical temporary detour bridge may cost around \$125,000 to construct, maintain and remove and results in additional environmental and right of way impacts. Detour structures are by nature additional work not inherent to the construction of the permanent structure. It may be cost-effective to utilize accelerated construction practices to eliminate the detour structure all-together by completing the new structure over a very short-term full closure. An example of this is the SH 66 Bridge over Mitchell Gulch in Colorado. On this project, the DOT implemented a Value Engineering proposal to place a prefabricated structure, which eliminated a 2-3 month detour in favor of a 48 hour closure.

Accelerated construction can be employed in other ways as well. Entire bridge decks have been replaced under partial short-term (night-time) lane closures, using precast deck panels and quick setting concrete.

Consider the following for accelerating construction:

- Use of Bulb Tee or Tri-deck Girders
- Precast substructures
- Precast caps
- Precast deck panels, full depth or partial depth with reinforced concrete overlay (partial depth panels act as stay-in-place deck forms and result in a 50% reduction in volume of cast-in-place concrete).

- Precast superstructure
- Use of spliced, prestressed girders for increased span length in order to reduce the number of intermediate bents
- Totally prefabricated bridges (launched or hoisted into place)
- Rapid cure materials
- On large structures, the use of multiple identical components
- Slip forming of bridge barrier and curb
- Allowing cold weather concrete placement and cure for bridge decks

See additional information at <http://www.fhwa.dot.gov/bridge/prefab/>

Additional Information

The following sources can provide more information on the strategies covered in this guide:

Procedure for determination of road user cost (RUC). New Jersey DOT:

<http://www.state.nj.us/transportation/eng/documents/RUCM>

MNDOT's Innovative Contracting Guidelines. Includes information on A+B Bidding, Lane Rentals, Incentives/Disincentives, Liquidated Savings, No Excuse Bonus, Design-Build, Warranties, Pay for Performance, and CPM Schedules:

http://www.dot.state.mn.us/const/tools/documents/Guidelines_000.pdf

A research paper on the Cost Effectiveness of Design-Build, Lane Rental, and A+B Contracting Techniques:

<http://www.ctre.iastate.edu/pubs/midcon2005/StrongContracting.pdf>

Ohio DOT's Innovative Contracting Manual:

<http://www.dot.state.oh.us/construction/OCA/InnovativeContractingManual04102006.pdf>

This website presents a brief overview of Alternative Contracting Methods including: A+B Bidding, Design-Build, Lane Rental, and Warranty Clauses.

http://www.fhwa.dot.gov/resourcecenter/teams/construction/cpm_6ics.cfm

See Utah State University's website on Innovative Contracting. It includes information on A+B Bidding, Lane Rental, Design Build, Warranty, and Job Order Contracting:

<http://www.ic.usu.edu/>

This is FHWA's website on Accelerated Construction Technology Transfer (ACTT).

http://www.fhwa.dot.gov/resourcecenter/teams/construction/cpm_1ac.cfm

AASHTO's Technology Implementation Group website.

<http://tig.transportation.org/?siteid=57>

FHWA website about Prefabricated Bridge Elements and Systems to accelerate construction.

<http://www.fhwa.dot.gov/bridge/prefab/>

Oregon's manual for workzone traffic analysis with information on delay and user cost evaluation:

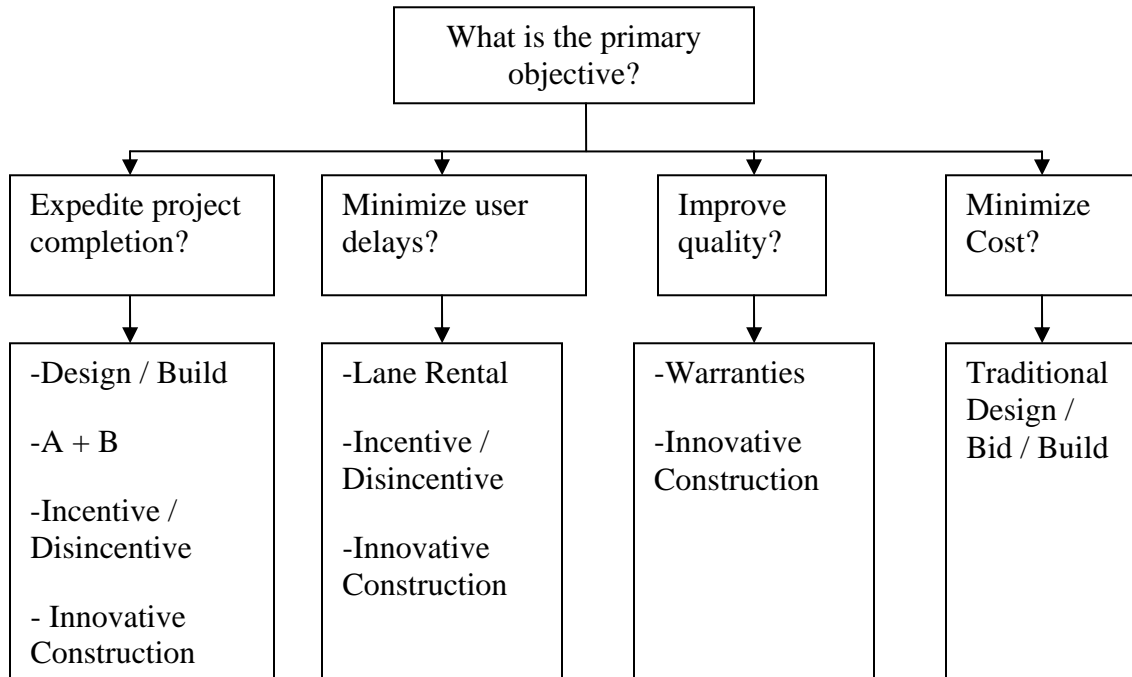
http://www.oregon.gov/ODOT/HWY/TRAFFIC/Temp_Traffic_Control_Plans/PDF/Work_Zone_Analysis_Overview.pdf

Estimation of road user cost:

http://www.virginiadot.org/vtrc/main/online_reports/pdf/98-r12.pdf

http://www.dot.state.co.us/Traffic_Manuals_Guidelines/Lane_Closure_Policies/R1_Lane_Closure_Report.pdf

Decision Tree



APPENDIX

EXAMPLE SPECIAL PROVISIONS

1. A + B BIDDING – INCENTIVE / DISINCENTIVE

A. General. The bidding process will include the amount bid for the contract and the bidder's statement of time necessary to complete Unit One of the project. The process will determine the low bid for Award.

B. Definition of Terms. The following definitions apply to this project.

1) Calendar Day. Any day or portion of a day, excluding Sundays, except as specified below.

a) State Holidays. Perform no work on any state holiday as defined in Subsection 101.36, through the weekend adjacent to the holiday. If the holiday occurs on a Wednesday, perform no work on the weekend prior to the holiday.

b) Perform no work during MDT's Engineering Conference.

On "No Work" days, including Sundays, assure that the roadway and the adjacent areas are clear of equipment and material to the satisfaction of the Project Manager.

Each calendar day begins and ends at midnight. Calendar time begins on the effective date stated in the "Notice to Proceed." The "Notice to Proceed" will be issued with an effective date of May 8, 2006.

2) Contract Amount. The sum of the quantities in the schedule of items multiplied by their respective unit bid prices, excluding the Time Total.

3) Daily Road User Cost. The dollar figure that represents the average daily cost to the traveling public resulting from disruption of normal traffic flow. The daily road user cost for unit one of this project is \$8,000.

4) Unit One. Work encompassed by this unit includes phases 1, 2 and 3, and is that point where all contract work is complete with the exception of the seal and cover and final striping, and all traffic is restored to its final flow configuration.

5) Unit Two. This includes seal and cover work, and final pavement markings.

6) Completion. Unit One: per completion of a final inspection for the unit per Subsection 105.15.2.

Unit Two: per Subsection 105.15.2.

7) Working Days. Applies to Unit Two only, per Subsection 108.07.2. The contract time for Unit Two is 20 working days. Perform no work during MDT's Engineering Conference.

C. Exempt Work Items. Producing and stockpiling surfacing aggregates, travel way maintenance, stormwater BMP maintenance, making emergency repairs to the project, and providing protection for the public are exempt from the no-work stipulation and may be accomplished on "No Work" days without assessment of contract time.

D. Preparation of Proposal. The bidder determines the number of calendar days to complete the project. That number may not exceed 425 days. The Department will consider bids with a number of calendar days greater than that amount non-responsive.

E. Consideration of Bids. Submit a bid consisting of two parts. Part A equals the contract amount. Part B consists of the total number of calendar days the

bidder proposes to complete the Unit One work. The Department will determine the apparent low bid by combining A and B according to the formula:

$$A + (B \times \text{Daily Road User Cost}) = \text{Amount Bid for Award Consideration.}$$

The Department will use this formula to determine the apparent low bid. It will not use this formula to determine contractor payments. Unit prices will determine contractor final payments, possibly adjusted by the following provisions.

F. Early Completion of the Project. The contractor will receive \$8,000 for each calendar day unit one is complete before the number of calendar days stated by the contractor in the bid, up to a maximum of 30 days.

G. Late Completion of the Project.

Unit One: The Department will deduct the daily road user cost of \$8,000 from contractor payments for each calendar day the contractor uses to complete Unit One beyond the number of calendar days stated by the contractor in the bid.

Unit Two: Liquidated damages will be assessed in the amount established by Subsection 108.08 if the working days specified for Unit Two is exceeded.

H. Time Extensions.

Calendar days will be added to the contract for extra work performed under Unit One that affects the critical path. The extra work must be shown to be on the critical path or affecting the critical path on an updated CPM schedule, as described elsewhere in the contract. **Submit notification of requests for time extension resulting from delay within five calendar days.**

The additional man-hours necessary to accomplish the additional work will be used to calculate the time extension. The additional time granted will equal that shown on the CPM schedule for the extra work and cannot exceed the percentage of man-hours dedicated to the additional work to the man-hours for all activities related to the critical path, multiplied by the number of days needed to complete the work, unless approved by the Project Manager. (For example, if ten people are working on a critical item and two are moved to an additional work item for five days, 2 divided by 10 times 5 days equals 1 additional day.)

Working days will be extended for extra work performed under Unit Two according to Subsection 108.07.4.

I. Conditions. The Engineer has sole authority to determine when the project is complete. This specification waives Table 108-1, Schedule of Liquidated Damages, for Unit One.

Use the Proposal Sites tab in the electronic bid software to enter the Calendar Days and complete the A+B bid. The Daily Road User Cost (\$8,000) represents the quantity of units for the item. Enter the number of calendar days the contractor proposes. The Electronic Bid system will total all items for the formula in section E, above.

2. LANE RENTAL

- A. General. The bid item LANE RENTAL-Lump Sum is included as part of this contract to provide incentive for the Contractor to minimize road user impacts. Determination of the low Bidder will be based on the price of construction plus the road user costs associated with lane closures that are anticipated in order to complete the blasting work.
- B. Definition of Terms Applicable to Lane Rental Assessment.
 - 1) User Cost- Added vehicle operating costs and delay costs to highway users resulting from lane or roadway closures.
 - 2) Duration- The number of hours each (Calendar) day that a closure is in place, rounded to the nearest 1/4 of an hour.
 - 3) Lane Closure- Denial of all or part of a lane to traffic. A lane width reduced to less than 3.35 m (11 ft) is considered a closure.
 - 4) Hourly Rental Rate- The user cost specified herein, in dollars per hour per 100 meters of lane closure that is used to calculate Lane Rental Assessments.
- C. Preparation of Proposal
 - 1) The maximum allowable bid amount for the item LANE RENTAL is \$_____.
 - 2) Estimate the Duration (hours) of all closures that will be necessary to complete the blasting operations and subsequent clearing of the roadway.
 - 3) Using the Lane Rental Rate Schedules below, calculate the Total User Cost associated with the closures.
 - 4) The bid amount for the item LANE RENTAL is equal to the Total User Cost.
- D. Consideration of Bids. For the purpose of Contract Award, the bid amount will be the total price bid for construction plus the amount bid for Item LANE RENTAL. Bids having an amount for item LANE RENTAL in excess of the maximum allowable amounts may be considered non-responsive and may be rejected.
- E. Method of Measurement
 - 1) Rental Rates

Lane Rental Rate Schedule for Single Lane Closure

Roadway	Closure	Impact	Hourly Rental Rate (dollars per hour per 100m length)
191	Single Lane closure	Weekday Peak (Defined as Monday through Friday, 6AM-7:30 PM all months)	1700
191	Single Lane Closure	Weekday Off-Peak	0
191	Single Lane Closure	Weekend Peak (Defined as Saturday and Sunday, 9AM-7PM July through September only)	600

191	Single Lane Closure	Weekend Off Peak	0
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Lane Rental Rate Schedule for Two Lane Closure

Roadway	Closure	Impact	Hourly Rental Rate (dollars per hour per 100m length)
191	Two Lane Closure	Weekday Peak (Defined as Monday through Friday, 6AM-7:30 PM all months)	4800
191	Two Lane Closure	Weekday Off-Peak	250
191	Two Lane Closure	Weekend Peak (Defined as Saturday and Sunday, 9AM-7PM July through September only)	1750
191	Two Lane Closure	Off Peak	250

2) Lane Rental Assessments. Lane Rental assessments will be applied to lane closures associated with blasting and associated mucking operations. Lane Rental will be assessed daily at the specified rental rates for each closure, for the duration that the closure is in place, whether or not work is in progress and regardless of weather conditions.

i. The Project Manager will record Assessments and will provide a copy of each days tabulated Assessments to the Contractor, on a daily basis. Submit to the Project Manager any disputes of the Assessments within one day of receipt of the tabulation. Failure to submit a dispute within the allotted time constitutes acceptance of the Assessment.

F. Basis of Payment. No direct payment will be made for the item LANE RENTAL–Lump Sum.

At the conclusion of the Project, if the total Lane Rental Assessments are less than the amount bid for LANE RENTAL, an incentive will be applied to the final estimate equal to the LANE RENTAL item bid amount minus the assessments. If the assessments exceed the LANE RENTAL item bid amount, a disincentive monetary deduction will be applied to the final estimate equal to the assessments minus the bid amount.