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Systematic Procedures to Determine Incentive/Disincentive Dollar Amounts for Highway Transportation Construction Projects

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The CA4PRS schedule-traffic-cost integration process helps highway traffic engineers and project managers implement the step-by-step procedures to determine an appropriate I/D amount.

The Federal Highway Administration (FHWA) has encouraged state transportation agencies (STAs) to implement Incentive/Disincentive (I/D) contracting provisions for early project completion to minimize traffic disruption during highway construction. The FHWA recommended that an I/D amount be calculated based on the estimated road user costs on a project-by-project basis. Although general guidelines to determine the I/D dollar amount for a project have also been published by STAs, there is no systematic tool in use to determine optimum I/D dollar amounts for I/D projects considering road user cost, agency cost, contractor's acceleration cost, and contractor's cost savings. Therefore, systematic procedures and models to assist project planners and engineers in determining an appropriate I/D dollar amount are essential to optimizing the use of I/D contracting techniques.

Study Methods

The research team performed a literature review related to the determination of daily I/D dollar amounts and collected Caltrans I/D project data, including construction type and location, construction time and cost information, average daily traffic (ADT), project length, I/D daily dollar amounts, and maximum incentive cap amounts. The project data obtained were evaluated using project performance indices. Project performance data were analyzed and evaluated regarding project outcomes in two key areas: project time and project cost. Statistical analyses were performed to identify the impact of I/D dollar amount on project time and cost performance. Using Construction Analysis for Pavement Rehabilitation Strategies (CA4PRS) software, an FHWA approved and Caltrans standard tool, Caltrans I/D projects were analyzed to introduce three different levels of CA4PRS implementations for the I/D dollar amounts calculation. Finally, using CA4PRS software, daily road user cost was calculated to determine a daily I/D amount that took into consideration road user cost, agency cost, contractor's acceleration cost, and contractor's cost savings. By incorporating the results of CA4PRS analysis into the systematic procedures to determine an appropriate I/D amount, the researchers proposed an improved procedure to assist transportation project planners and engineers in their decision-making process.

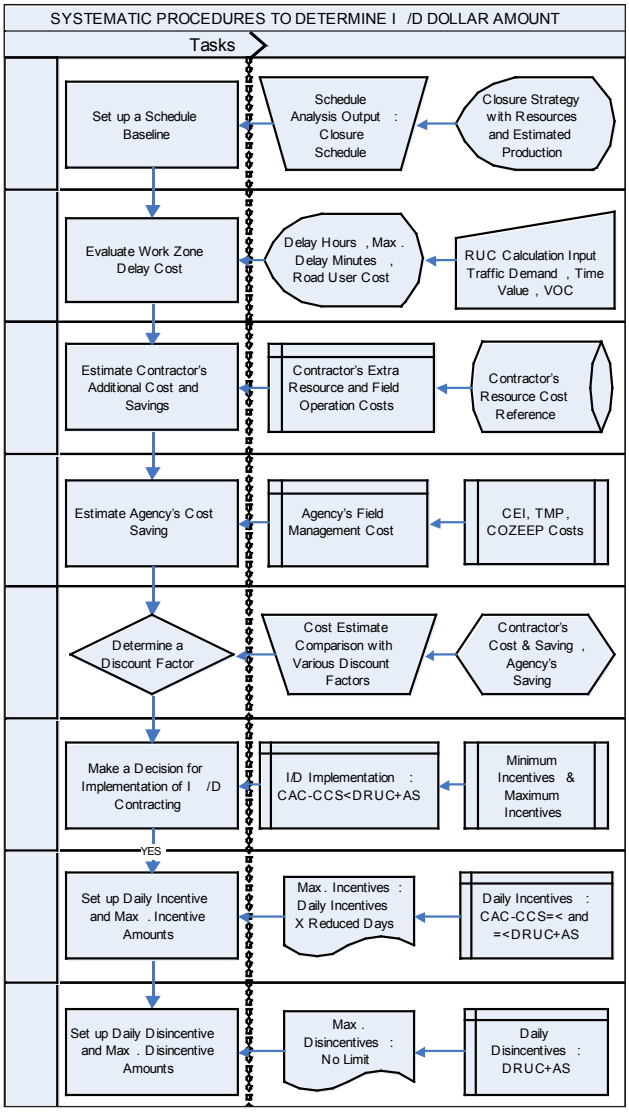
Findings

A number of statistical analyses were performed to identify any relationships among 1) the incentive amount and original time performance index (OTPI); 2) the incentive amount and original cost performance index (OCPI); 3) the incentive amount and project award amount;

and 4) the incentive amount and ADT. The results of correlation analysis showed positive relationships for OTPI, project award amount, and ADT. On the other hand, the incentive amount showed a negative relationship with OCPI. A range of approximately 27% to 40% correlation between two variables was found from four correlation analyses. In addition, the results of nonparametric analysis showed that only the comparison between ADT and project time performance was significant. This result indicates that improving project time performance in a high-ADT work zone is more difficult than in a low-ADT work zone.

Based on the results of the I/D project case studies, the systematic procedures to determine appropriate I/D dollar amounts were developed using the CA4PRS schedule-traffic integration process for the new I-5 rehabilitation project in LA. The step-by-step procedures start with project schedule analysis to set up a schedule baseline in a given project situation. Then the impact of work zone delay is evaluated. In the next step, the cost of the contractor's additional resources and agency savings caused by schedule compression are estimated. Finally, I/D dollar amounts for a project are determined.

The proposed procedures were applied to a typical highway pavement rehabilitation project using hot mix asphalt) (HMA) materials. A similar case study is needed for a typical concrete pavement rehabilitation using the project's own resource inputs for schedule acceleration. More study is needed to apply the concept to other types of highway projects, with adjustment for the type of project.



Policy Recommendations

For better implementation of I/D contracts on highway projects, the authors recommend that I/D provisions include systematic guidelines to determine an appropriate I/D dollar amount by balancing road user cost, agency cost, contractor's acceleration cost, and contractor's cost savings. In addition, the effectiveness of the proposed I/D amount model should be evaluated on a project-by-project basis to refine the use of I/D contracting.

About the Authors

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To Learn More

For more details about the study, download the full report at ***transweb.sjsu.edu/project/2908.html***

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