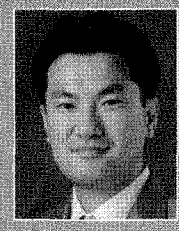
KICEM

Innovative Contracting Techniques for Highway Construction Projects:
Incentive/Disincentive Provisions

Jae-Ho Pyeon Assistant Professor
Civil and Environmental Engineering
San Jose State University



Delays of highway construction projects are increasingly becoming an issue of national concern in the United States. While it is true that completed construction projects add to the value of transportation systems, the construction process itself can adversely affect local businesses and the traveling public. Furthermore, the road congestion caused by construction increases highway accidents, drivers' operating costs of their vehicles, travel times, and air pollution. Consequently, there is a growing recognition that attention must be given to minimizing the negative effects of transportation construction projects.

As the volume of highway traffic in the United States continues to increase, there is a concomitant need to improve and repair transportation infrastructure. The US Department of Transportation (USDOT) encourages state highway agencies to maintain a proactive highway work program. Transportation construction activity often requires a temporary reduction in road capacity, so motorists as well as adjacent businesses must endure the delays, costs, and inconveniences associated with transportation construction. Recognizing the problems that construction can produce, the Federal Highway Administration (FHWA) has continuously sought ways to minimize the negative impacts from construction operations. One key aspect has been to seek improvements in construction project performance and, more specifically, to accelerate project completion whenever possible.

Until the mid-1980s, the FHWA had a firm policy based on the belief that "the FHWA should not have to pay 'extra' just to have a project completed early" (FHWA 1989). Despite this, the new policy which allows participation in "bonus payments for early completion" was established in the late-1980s. This policy was partially based on the evaluation outcome of National Experimental and Evaluation Program Project #24 showing that I/D provisions are an important cost-effective management tool for a construction project. The FHWA published a technical advisory report entitled Incentive/Disincentive for Early Completion in 1989 for providing "guidance for the development and administration of I/D provisions for early completion on highway construction projects or designated phase(s)."

Utilizing innovative contracting techniques such as Incentive/Disincentive (I/D) provisions, A+B (cost plus time) bidding, Liquidated Savings clause, No Excuse Bonus contracting, etc, has been very successful at improving project time performance. In particular, I/D contracting, a well-known transportation

construction contracting method, is designed to minimize the disruption of traffic flow in highway construction projects. Construction project planners and managers have used I/D contracting as one of their management tools to achieve their project objectives. More than 35 state highway agencies have implemented I/D contracting to improve contractors' project time performances in transportation construction. Incentives have been used specifically to encourage the early completion of highway construction projects and, as a result, substantial project time savings have been reported for many projects.

One exemplary instance of successful I/D contracting was in the wake of the April 29, 2007, accident when the driver of a fully loaded gasoline tanker truck lost control on the Interstate 880 connector (MacArthur Maze, Oakland, California) and the truck crashed and exploded in a ball of fire. The intense heat generated by the fire melted and collapsed a portion of the Interstate 580 connector ramp crossing above the accident site. California Department of Transportation (Caltrans) immediately began an emergency project plan to mitigate the projected massive traffic delays on this vitally busy section (80,000 cars daily) of the San Francisco Bay Area road system. Cleanup and demolition of I-880 and I-580 connector off-ramps had a projected cost of $9 million. State and federal transportation officials had estimated the cost of lost worker productivity and commuter cost for the closure of the I-580 off-ramp to range from $4 million to $6 million a day. Bids were immediately sought to repair and rebuild the damaged I-580 off-ramp. The initial Caltrans repair estimate for rebuilding the accident site was $5.2 million. The project was put out to bid with an I/D provision of $200,000 per day for every day the work was completed ahead/behind the contract deadline. A cap of $5 million was the maximum incentive amount a contractor could collect. No cap was set for the maximum penalty (disincentive) amount. Caltrans accepted a bid for $867,075 from the C.C. Myers Company. Based on this low bid for a project of this magnitude, it was obvious that the contractor was counting heavily on the company achieving much or all of the contract incentive. The contract called for a work schedule of 50 days. By finishing 26 days earlier than the contract deadline, C.C. Myers collected the maximum $5 million bonus, as well as the contract amount. This I/D contracting example is one of the most successful transportation construction projects to date.

The FHWA advisory defined the I/D provision as "a contract provision which compensates the contractor a certain amount of money for each day identified critical work is completed ahead of schedule and assesses a deduction for each day the contractor overruns the I/D time." To better utilize I/D provisions, it was recommended that they be limited to "those critical projects where traffic inconvenience and delays are to be held to a minimum." With regard to the I/D dollar amounts, it was also recommended that the amounts be based upon cost estimates of the following factors: traffic safety, traffic maintenance, and road user delay costs. A daily I/D amount is calculated on a project-by-project basis.

I/D contracting experiences in many states have been evaluated in terms of time and cost performance. It has been found that there were substantial project time savings from many project cases. However, it has also been reported that there have been many inefficient cases using I/D contracting for various transportation construction projects. For instance, many contractors were able to achieve maximum incentives without reducing the original contract time since the incentives were generally paid based on the extended contract

duration, which included time extensions, supplemental agreement days, and weather days. These inefficiencies can often be attributed to a poor understanding of the factors that affect the suitability of using I/D contracts. Therefore, a better understanding of such project factors as contract types, project types, project sizes, project locations, incentive amounts, quality of contract documents, and other similar factors is key to providing clear guidance for optimizing the use of I/D contracting.

Another key issue with regard to the I/D contracting technique is to determine an appropriate I/D dollar amount for a construction project in order to motivate the contractor to complete the project early. Early completion could be accomplished by working extra hours/days and/or using innovative equipment and techniques. However, the issue of appropriate I/D dollar amounts has been a major barrier for many transportation district project planners and engineers wanting to use I/D provisions for their transportation construction projects.

In conclusion, based on a comprehensive evaluation of I/D contracting projects completed, contractors' time performance on I/D projects compared to Non-I/D projects showed significant improvements. The I/D contracting technique is a useful project management tool to motivate the contractor for early completion of the project and is popularly being used for highway construction projects. The FHWA is continually seeking ways to refine and improve the use of I/D provisions in the areas of the I/D project selection criteria and a systematic procedure for the determination of an appropriate I/D dollar amount. These efforts will benefit state highway agencies and local governments to improve the efficiency of assigning I/D contracts and to assist transportation construction project planners and managers to make better decisions by implementing I/D provisions with confidence.

REFERENCES

1. American Association of State Highway and Transportation Officials (AASHTO). (2006). "Primer on Contracting for the Twenty-first Century," Report, Contract Administration Section of the AASHTO Subcommittee on Construction, Fifth Edition, Washington, D.C.
2. Anderson, S. and Damnjanovic, I. (2008). "Selection and Evaluation of Alternative Contracting Methods to Accelerate Project Completion," National Cooperative Highway Research Program (NCHRP), NCHRP synthesis 379, Transportation Research Board, National Research Council, Washington, D.C.
3. Arditi, D., and Yasamis, F. (1998). Incentive/Disincentive Contracts: Perceptions of Owners and Contractors. Journal of Construction Engineering and Management, 124(5), 361-373.
4. Christiansen, D. L. (1987). "An Analysis of the Use of Incentive/Disincentive Contracting Provisions for Early Project Completion," Transportation Management for Major Highway Reconstruction, Special Report 212, Transportation Research Board, Washington, D.C.
5. Ellis, R., Pyeon, J., Herbsman, Z., Minchin, E., & Molenaar, K. (2007). "Evaluation of Alternative Contracting Techniques on FDOT Construction Projects." Final Report, Florida Department of Transportation, Tallahassee, Florida.
6. Federal Highway Administration (FHWA). (1989). "Incentive/Disincentive for Early Contract Completion." FHWA Technical Advisory T5080.10, Washington, D.C. 〈http://www.fhwa.dot.gov/legsregs/directives/techadvs/t508010.htm〉 (June 28, 2010).
7. Federal Highway Administration (FHWA). (2008). "Contract Administration Core Curriculum Participant's Manual and Reference Guide." Office of Infrastructure and Office of Program

Administration, Contract Administration Group, FHWA, Washington, D.C. 〈http://www.fhwa.dot.gov/programadmin/contracts/index.htm〉 (June 28, 2010).

8. Gillespie, J. (1997). Estimating User Costs as a Basis for Incentive/Disincentive Amounts in Highway Construction Contracts. Final Report, Virginia Transportation Research Council, Charlottesville, The Federal Highway Administration, Washington, D.C.
9. Herbsman, Z., Chen, W., and Epstein, W. (1995). Time is Money: Innovative Contracting Methods in Highway Construction. Journal of Construction Engineering and Management, 121(3), 273-281.
10. Jaraiedi, M., Plummer, R., and Aber, S. (1995). Incentive/Disincentive Guidelines for Highway Construction Contracts, Journal of Construction Engineering and Management, ASCE.
11. Minnesota Department of Transportation (MnDOT). (2005). "Innovative Contracting in Minnesota 2000 to 2005." Office of Construction and Innovative Contracting. MnDOT, Minnesota.
12. PinnacleOne. (2004). "Summary Level Study of A+B Bidding." A+B Bidding Evaluation Final Report, Office of Engineering Management, California Department of Transportation. Sacramento, California.

· Jae-Ho Pyeon e-mail : jae.pyeon@sjsu.edu