

Construction and Contract Issues¹

DAVID S. GENDELL
FEDERAL HIGHWAY ADMINISTRATION

1. *Cost-effectiveness of accelerated contracting procedures to traffic management (includes the use of incentive/disincentive clauses)*
 - By minimizing the period of traffic disruption due to construction, specific road user costs can be reduced:
 - Accident costs
 - Delay costs
 - Operating costs
 - Traffic control costs
 - Accident costs are reduced by minimizing the time traffic is exposed to hazards present in the work zones.
 - Delay costs reflect the value of time lost while one is traveling through a work zone. Although establishing a dollar value for time is highly controversial, everyone agrees that long delays in work zones consume valuable time.
 - Reduction in construction time also minimizes operating costs associated with speed-change cycles and delays.
 - Since rentals of traffic control devices are generally on a daily basis, overall traffic control costs for a given project can be reduced with shorter project durations. Similarly, the state can reduce construction engineering costs, and the contractor can often reduce insurance, equipment, and overhead costs.
 - Accelerating projects is a cost-effective approach when the benefits of the approach (reduced road user costs) exceed the costs of implementation. However, the road user costs depend on many factors, such as the amount of traffic affected, the reduction in project duration, and the nature of the construction. In addition, many intangible benefits and costs are associated with the approach. Therefore, no clear-cut formula exists to determine when the approach should be used.
 - In general, the approach is recommended for projects in which the following conditions occur:
 - Significant road user costs can be saved

¹ This outline and the preceding paper by Dennis L. Christiansen formed the basis of the panel discussion on construction and contract issues.

- Continuously high traffic volumes cannot be easily diverted
 - Project construction time can be substantially reduced
 - Work is well-defined (since unanticipated work creates contractual difficulties)
 - Adequate funds are available to cover the contractor's added costs
2. *Negotiating or establishing amounts of incentives or disincentives (I/D)*
- The amount of incentive and disincentive must be of significant benefit to the contractor to encourage interest, stimulate innovative ideas, and maintain profitability while meeting tight schedules.
 - The maximum amount of I/D payment should be based on the anticipated users' savings. References that may be used to estimate these costs include:
 - A Manual on User Benefit Analysis of Highway and Bus Transit Improvements*, 1977, AASHTO, Washington, D.C.
 - Traffic Control for Streets and Highway Construction and Maintenance Operations*, FHWA, 1978 (This publication is currently being updated and its replacement is entitled *Design and Operation of Work Zone Traffic Controls*.)
 - Planning and Scheduling Work Zone Traffic Control*, Report FHWA IP-81-6, FHWA, October 1981.
 - Certain road user costs should not be used in the calculations, such as insurance, parking costs, tolls, and certain taxes.
 - Maximum I/D that has been used recently was \$30,000 for a major urban freeway project.
 - Total amount of the payment normally should not exceed five percent of the total project costs.
 - A large incentive payment may be questioned by the public and news media. Therefore, we should be in a position to show that a savings has been made to the public.
3. *Application of new materials or techniques to speed construction*
- High early-strength concrete, such as the material used for the "fast-track" concrete paving operations
 - Special and/or high production equipment, such as the use of specialized demolition machinery to rapidly remove deteriorated bridge decks
 - Redesigning the highway or bridge to expedite construction, such as the use of precast, prestressed concrete deck forms that become part of the deck
 - Critical Path Method and other management tools to assure maximizing manpower and resources
 - Precast concrete bridge deck panel used on the Woodrow Wilson Bridge project
 - Use of full-width steel grates to serve as temporary bridge deck sections during construction
 - Slipforming concrete barriers
4. *Benefits/Disadvantages of speeding up construction*
- Benefits
 - Less time to complete project
 - Avoidance of traffic congestion, motorist delay, and driver inconvenience
 - Reduced road users' cost (accident, delay, operating, and traffic control costs)
 - Better public relations
 - Reduced inflation costs
 - Allows contractor to bid on more projects, thereby stimulating competitive bidding
 - Disadvantages
 - Higher contractual costs due to increasing the number of crews, personnel

recruitment problems, higher pay differentials, material acquisition, additional and/or special equipment, etc.

- May reduce construction quality due to lower work force morale, thereby requiring higher inspection demands and other related construction engineering costs
- Requires more preparatory work by the state
- Contractor claims or requests for price/time adjustments may be more likely when unanticipated work delays completion time.
- Environmental considerations (such as nighttime operations creating noise and lighting problems to nearby residents)

5. *Contractual responsibilities: What needs to be in the contract for better traffic management*

- Engineering time spent during project development pays dividends during construction. A field change to correct mistakes in plans can cost time and money.
- Plans and specifications must be complete and accurate to provide a clear understanding of what is to be constructed. Any error may result in a claim.
- Plans and specifications should indicate any unusual condition or restriction affecting the contractor's operations.
- Local officials, police, local traffic engineers, construction engineers, and other appropriate parties should be involved in the project development.
- Predesign survey is essential since as-built plans or old construction plans are often unreliable.
- Contract time needs to be carefully determined:
 - Recommend the use of the Critical Path Method (this approach also is useful in settling claims, determining time adjustments, and evaluating the progress of work)
 - Contract time should be on a calendar day basis or using a specified completion date (working day basis has been found to be less effective and puts pressure on the project engineer in determining the number of working days)
 - Project or major phase of the project should be completed in one construction season if feasible
- Effect of field changes and how field changes will be evaluated for time adjustments must be clearly spelled out in the project documents. Contract time adjustments should be limited to only major work items affecting completion and should be so identified in the contract.
- A specific definition of what constitutes the completion of the project to avoid potential legal hassles
- A clear and comprehensive traffic control plan. This plan should include measures to provide for adequate worker safety. Traffic conditions can be potentially hazardous to workers under an accelerated project.
- Unit bid items for traffic control devices result in more control over the devices by the state.
- Use of an effective traffic control strategy to minimize construction time, e.g., total roadway closure, and two-way, two-lane operations on normally divided highways

6. *Enforcement of contract*

- State is under pressure to maintain adequate quality control under accelerated conditions.
- Project needs to be adequately staffed by qualified people who are adequately compensated and available whenever the contractor is working.

7. *Legal considerations*

- Contractor claims may occur when a delay occurs and affects the specified completion date; therefore, the state should take steps necessary to avoid or minimize such delays:
 - Well-defined, accurate plans and specifications
 - Early preparation work such as railroad and utility adjustments completed in advance or clearly defined and coordinated
 - Use of the Critical Path Method to minimize contract time
 - Have experienced, qualified project personnel with approval authority when the contractor is working
- Project personnel should provide adequate project documentation
- Important to conform to MUTCD and other traffic control standards in the event of lawsuits

8. *Contractor/Agency relationship*

- Coordination among the contractor, state, and the FHWA is essential. Delays in the approval of a field change or working drawings can cost time.
- Approval authority must be known by all and be available throughout the project life in order to minimize delays in the approval of a field change.
- Need to hold regular progress meetings
- Clearly established lines of communication and ensuring that all appropriate parties have involvement in reviewing plans, shop drawings, etc.

9. *Innovations*

- Award a project to a low bidder based on the dollar amount for all work and the amount of time the contractor will use on the project. The low bid would consist of the dollar amount plus the product of the "bid time" and the road user cost per day.
- Establish a special task force responsible for managing, organizing, and coordinating efforts throughout the life of the project. This task force should be given sufficient authority to cut through red tape.
- Conduct constructability reviews to assure that the plans and specifications are reasonable, e.g., minimize discrepancies between construction operations and traffic control requirements.
- Provide contingency plans covering possible situations, such as long construction delays, delays caused by third parties (e.g., utility and railroad companies), and inclement weather.
- Assure that strategic materials and equipment are available throughout the life of the project:
 - Let projects in fall or early spring to give contractors time to mobilize and order materials
 - The state should consider buying strategic materials before bid opening for projects with tight schedules.
 - Require stockpiling of materials that may be needed
 - Provide for backup equipment, particularly for critical operations
- Establish a public relations staff to provide press releases, commuter guide publications, hot-line phone numbers, meetings with citizen groups, etc., and information to travelers on construction operations and their effect on traffic conditions.
- Subcontractors can be assigned sole responsibility for maintaining the traffic control devices and reporting directly to the state.
- Some contractors have distributed incentive payments to their employees.

We can do a good job on these difficult projects. It will take proper engineering, attention to detail, a close working relationship among everyone, and, most important, a commitment to quality.

Think of it as a challenge. It will not be easy, but we have to consider the public and their travel and safety needs, because ultimately, all of us in the highway field are working for them.