

INNOVATIVE CONTRACTING PRACTICES

JOHN G. ROHLF

In 1990 the Federal Highway Administration initiated Special Experimental Project 14 (SEP 14), "Innovative Contracting Practices," to evaluate contracting practices considered to be innovative to the U.S. highway industry. In addition, SEP 14 is the vehicle through which the findings and recommendations of the Transportation Research Board Task Force on Innovative Contracting Practices are being validated.

The objective of SEP 14 is to identify, evaluate, and document innovative contracting practices that have the potential to reduce the life-cycle cost of projects while maintaining product quality. Although federal statutes and regulations set forth specific federal-aid program requirements, some degree of flexibility exists. The intent of SEP 14 is to explore this flexibility to its fullest.

Several innovative contracting techniques have been identified for evaluation, including cost-plus-time bidding, lane rental, design/build contracting, warranty clauses, and incentives for improved quality. All innovative practices approved for evaluation are required to be compatible with the open competitive bidding process. FHWA has no intention of avoiding or altering the current policy of awarding contracts to the lowest responsive and responsible bidder.

Cost-Plus-Time Bidding

Cost-plus-time bidding, more commonly referred to as A+B bidding, involves contract time, with an associated cost, in determining the low bid. Under A+B bid-

ding, each bid submitted consists of two parts. The "A" component is the traditional bid for the contract items and is the dollar amount for all work to be performed under the contract. The "B" component is a bid for the total number of calendar days required to complete the project, as estimated by the bidder. Calendar days should be used to avoid the potential for controversy that may arise if work days are used.

The lowest and best bid is based on a combination of the bid for the contract items and the associated cost of the contract time, according to the formula $A + (B \times \text{road user cost/day})$. The road user cost per day is determined by the contracting agency and is specified in the bid documents. This formula is used only to determine the lowest and best bid and not to determine payment to the contractor. The contractor is paid for the work performed (i.e., the items included in the A component). The final payment to the contractor is adjusted by any incentive or disincentive earned.

A disincentive provision must be incorporated into the contract to discourage the contractor from overrunning the contract time bid for the project. The daily disincentive amount should equal the daily road user cost used in the award determination. In addition, an incentive provision may be included in the contract to reward the contractor for completing the work in less than the bid time.

The A+B bidding concept is not appropriate for all projects. However, for critical projects that significantly affect road users, the A+B bidding concept can be an effective technique to greatly reduce such interference. The following states have used A+B bidding on at least one project: Arkansas, California, Colorado, Delaware, Georgia, Idaho, Iowa, Kentucky, Mary-

land, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New York, North Carolina, North Dakota, Pennsylvania, South Carolina, Texas, Utah, Virginia, and the District of Columbia. Of these, Maryland, Missouri, and North Carolina have been the most active users.

The application of A+B bidding was demonstrated recently on a project to repair a portion of the Santa Monica Freeway (Interstate 10) that was damaged severely by the January 1994 earthquake. (The freeway, which normally carries 257,000 to 340,000 vehicles a day, is a critical link in the economy of the Los Angeles area.) The estimate for the project was \$21 million, and a cap on the time to open to traffic was set at 150 days. A road user delay cost of \$330,000 was calculated on the basis of the number of users and the estimated delay. A daily incentive/disincentive of \$200,000, about 60 percent of the calculated road user cost, was included in the contract.

The contract was let on February 4. The A and B components of the lowest responsive, responsible bid were \$14.9 million and 140 calendar days, respectively. As a result of contract changes, the contract amount was increased to \$17.4 million and the time decreased to 135 days. I-10 was reopened on April 11, after only 66 calendar days of construction and 84 days after the earthquake. By completing the project 69 days early, the contractor earned an incentive of \$13.8 million and saved the traveling public an estimated \$22.8 million in delay cost.

The following is an excerpt from a state resident engineer's project report for a recently completed A+B contract in another state:

This was the most efficient and well-organized project that I have been

John G. Rohlf is Highway Engineer, Office of Engineering, Federal Highway Administration, U.S. Department of Transportation.

associated with in my 37 years with [the state department of transportation]. Some contractors said the contract should not be awarded to [the low bidder], as they felt it was impossible to complete the project in the time they specified, but the contractor not only completed it in time to receive the full incentive, [but] also did an excellent job.

Lane Rental

As with cost-plus-time bidding, the goal of lane rental is to encourage contractors to decrease the effects on road users during construction. Under the lane rental concept, a provision for a rental fee assessment is included in the contract. The fee is based on the estimated cost of delay or inconvenience to the road user during the rental period. It is assessed for the time that the contractor actually occupies or obstructs all or part of the roadway. The assessed fees are deducted from the progress payments.

The rental fee amount is stated in the bidding proposal, but neither the contractor nor the contracting agency gives an indication of the anticipated amount of time for which the assessment will apply. The low bid is determined solely on the basis of the lowest amount bid for the contract items. The rental fee depends on the number and type of lanes (e.g., through lane, turn lane, ramp, shoulder) or combination of lanes closed. It can vary for different hours of the day (e.g., a higher rate may be charged during peak traffic hours and a lower rate during the off-peak evening hours).

The intent of the lane rental concept is to encourage contractors to schedule their work so that traffic impacts are kept to a minimum, in terms of both duration and number of lane closures. This concept has merit for use on projects that significantly affect the traveling public.

Five states have used the lane rental concept. Colorado, Indiana, Oklahoma, and Washington have assessed rental fees that ranged from \$1,500 to \$15,000 per day. On a project in Oregon, fees were assessed for 15-minute increments: the fees per 15 minutes of single-lane closure



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Top: Santa Monica Freeway soon after January 1994 earthquake. Center: Freeway as demolition progresses. Bottom: Rebuilt structure.

ranged from none for low traffic periods to \$21,000 for peak periods.

Design/Build Contracting

The design/build concept gives the contractor maximum flexibility for innovation in the selection of design, materials, and construction methods. Under this concept, the contracting agency specifies the end result and establishes the minimum design criteria. The prospective bidders then develop design proposals that best use their construction abilities. The submitted proposals are rated by the contracting agency on the basis of design quality, timeliness, management capability of the bidder, and cost.

By allowing contractors to optimize their work force, equipment, and scheduling, the design/build concept opens up a new degree of flexibility for innovation. However, along with the increased flexibility, the contractor must also assume greater responsibility. An extended liability insurance or warranty clause should be used to ensure that the finished product performs as required.

From the perspective of a state highway agency (SHA), the potential time savings is the biggest benefit. Because both the design and construction are performed through one procurement, construction can begin before all the design details are made final (e.g., pile driving could begin while the bridge lighting was still being designed). Because both design and construction are performed under the same contract, claims for design errors or delays due to redesign are not allowed and the potential for other types of claims is greatly reduced.

FHWA has reviewed the design/build concept for compatibility with current federal laws and regulations. It has been determined that the design/build concept may be evaluated on federal-aid projects on an experimental basis under SEP 14, provided that contracts are awarded using competitive bidding procedures. The design/build concept should be applied only to those projects for which the end product or facility can be well defined.

In June 1992 FHWA initiated a consul-

tant study on the use of design, build, and warrant (D/B/W) contracting. The objectives of the study were to identify the technology necessary for implementation, identify impediments, and assess the value and benefits of D/B/W contracting. The study has been completed and a report distributed to the American Association of State Highway and Transportation Officials, the construction trade associations, and the SHAs through the FHWA field offices. A working group made up of representatives from various segments of the industry is evaluating the recommendations in the report and developing an appropriate course of action. The initial task of the working group is to identify and compile the positions of various organizations on the concept.

In 1987 Florida undertook a state-funded design/build pilot program. Thirteen projects, with a total contract value of \$40 million, were constructed under the program. No direct cost savings occurred, but project times for design/build projects were up to 40 percent shorter than those of normal projects. Claims were essentially eliminated, and both the state and industry participants indicated overall support for the concept.

Several states have undertaken or are now developing design/build projects. Alaska is developing such a project for the construction of a ferryboat. An emergency relief bridge replacement project was constructed in Arizona using the design/build concept. California is using the concept on several large toll road projects as well as for the replacement of an earthquake-damaged bridge in Los Angeles. Colorado has used the design/build concept with a one-year warranty on a small urban roadway reconstruction project. North Carolina is developing the concept for the Congestion Avoidance and Reduction for Automobiles and Trucks project in Charlotte. The concept is being used in Michigan for a congestion management system project.

Warranty Clauses

Warranties have been used successfully in other countries, and by some SHAs on non-

federal projects, to protect investments from early failure. Current FHWA regulations (23 C.F.R. 8635.413) prohibit the use of warranties on federal-aid projects. The rationale for this restriction is that such contract requirements could result indirectly in participation in maintenance cost. The use of federal-aid funds for normal maintenance purposes is prohibited by law.

The Intermodal Surface Transportation Efficiency Act of 1991 created an exception to this restriction. ISTEA provides certain flexibility for federal-aid projects that are not on the National Highway System and for which a state requests exemption from FHWA oversight (i.e., exempt non-NHS projects). For such projects, warranty clauses may be used in accordance with the state's laws and procedures.

FHWA has approved, for evaluation under SEP 14, warranty concepts with the objectives to improve quality and increase contractor accountability. Shifting the maintenance burden to the contractor is not the intent of such warranties. Ordinary wear and tear, damage caused by others, and routine maintenance remain the responsibility of the contracting agency.

Many European countries use some form of warranties, with an average two-year duration, in highway contracts. The consensus of the Europeans is that although warranties alone do not improve quality, they do help to ensure construction quality.

Recently published NCHRP *Synthesis of Highway Practice 195: Use of Warranties in Road Construction* (Donn Hancher, University of Kentucky, research consultant) documents the use of warranties in the United States and Europe. The merits and drawbacks, applicability to road construction, and possible ways to enhance the use of warranties are discussed in the report.

Section 1043 of ISTEA required the General Accounting Office to conduct a study of ways to improve the quality of federal-aid highways. As part of this study, GAO was to look at the effects of warranty clauses relative to the cost and potential benefits; liability, insurance, and bonding concerns; the impact on small, minority-owned, and disadvantaged busi-

nesses; and the permissibility of such clauses without additional legislation. GAO completed its study and the final report was published in September 1994.

Of the six states evaluating the use of warranties under SEP 14, Michigan has been the forerunner. Michigan began evaluating warranties on two state-funded bridge painting contracts in 1990 and expanded its evaluation to a select number of federal-aid bridge painting projects beginning in 1991. The objective of the warranty provision, which requires the contractor to post a two-year performance bond, is to encourage quality workmanship in the application of the state's high-technology painting system. The paint system requires careful preparation and application by the contractor. Michigan is also evaluating two-year warranties on two concrete pavement repair projects.

Other states evaluating warranty provisions are Missouri (three-year warranties on two rubberized asphalt overlay projects), Washington (five-year warranty on a bridge deck expansion joint system), Montana (three-year warranty and four-year warranty on two durable pavement marking projects), New Hampshire (two-year bridge painting warranty), and California (three-year warranty and five-year warranty on two rubberized asphalt pavement projects).

Incentives for Improved Quality

Many SHAs, and parts of the construction industry, already have incentive programs under way that are designed to improve the quality and durability of construction. Pay adjustments based on quality are the most commonly used incentive.

The construction industry should be involved in the development of pay adjustments that are based on quality (e.g., asphalt density, pavement smoothness, aggregate gradation). In addition, pay adjustments should be based on readily measurable characteristics that relate to performance. If there is not a measurable benefit—an increase in quality—to the road users, then the additional expenditure of the incentive is not justified.

TRB Task Force on Innovative Contracting Practices

In 1987 the Transportation Research Board Task Force on Innovative Contracting Practices was formed to evaluate innovations in contracting. The task force was composed of 23 representatives from all segments of the highway industry. The mission of the task force was to

- Compile and research information on contracting practices used by agencies in the United States and other countries;
- Assess how current contracting practices affect quality, progress, and cost; and
- Suggest measures for improving contracting practices and promoting quality in construction.

The findings of the task force are documented in *Circular 386: Innovative Contracting Practices*, published by TRB in December 1991.

To date the use of incentive provisions has focused primarily on pavement smoothness. Approximately 28 states use incentives for concrete pavement smoothness and 20 do so for asphalt pavement smoothness. Seven states use incentives for other asphalt pavement properties, such as air voids, density, and asphalt content. Only one state uses an incentive provision for concrete pavement compressive strength. Increased use of incentive provisions is anticipated as more information becomes available about the long-term effect of such properties on pavement performance.

Other Concepts

Innovative contracting practices that may have merit for evaluation are not limited to those discussed here. FHWA encourages SHAs and industry to submit for consideration any concept or practice considered to have potential to benefit the highway program. Private-sector participation in providing government services—also called privatization, public-private partnerships, or “pay-for-performance”—is one such concept that was proposed by a contractor for possible development and evaluation under SEP 14.

The concept of pay-for-performance can be considered as a form of design/build or design/build/operate. Under this concept, the contracting agency would specify the pavement criteria, including performance parameters, and the investor (i.e., contractor) would furnish a pavement at no initial cost to the contracting agency. Compensation would be made through equal annual payments over the life of the contract.

Draft guidance specifications for the concept were developed by FHWA and distributed to AASHTO and the contracting associations for review. Because of lack of positive support for further development of the pay-for-performance concept, it will not be pursued, at least on a national level, at this time.

European Study Tour

Because of the interest shown by the highway community in exploring European practices that have a positive effect on quality, the Contract Administration Techniques for Quality Enhancement Study Tour was undertaken in the fall of 1993. The study tour reviewed contract administration procedures in Germany, France, Austria, and Spain. Similar to tours in 1990 and 1992 on asphalt and concrete, respectively, the study focused on contract administration practices and quality controls that might apply to the U.S. highway program. The tour was considered a success, and in June 1994 FHWA issued a report that documents its findings.

Conclusion

In February 1992 the FHWA Administrator encouraged each SHA to try a new or innovative practice on at least one project. FHWA is continuing to encourage the evaluation of any promising innovative contracting practice that falls within the flexibility of the federal-aid program requirements. With the support of industry, this initiative to promote contract procedural improvements that enhance

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NYSDOT Soil Mechanics Bureau Celebrates 50th Anniversary

The New York State Department of Transportation's Soil Mechanics Bureau, which provides a wide variety of multimodal geotechnical services to meet the department's current \$1.3 billion annual Capital Program, is marking its 50th anniversary.

Near the end of World War II, NYSDOT (then called Public Works) recognized that a surge in building construction would be necessary to modernize its transportation system. Soils engineering was growing in importance as a discipline in the civil engineering field because of past experience with foundation problems, and the Soil Mechanics Bureau was created.

Much of the bureau's early experience was obtained in the construction of the New York State Thruway from 1946 to 1955. In later years the bureau implemented many innovative geotechnical technology projects, such as control of dikes at the St. Lawrence Seaway, construction of embankment and bridge foundations on the federal Interstate highway system, and emergency repair of the Almond Dam during the 1972 hurricane Agnes. Recently the bureau has also developed a pavement design manual for new and reconstructed pavements to meet infrastructure repair needs into the next century.

Profiles

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help people cope with the budgetary implications of ADA. He finds, however, that in light of local budgetary pressures, the cost of adhering to ADA may put cities at possible risk of falling short of expectations in the deadline year of 1997.

Lewis divides his consulting practice equally between public and private sector clients and his practice between the United States and Canada. It is, he says, a life not inconsistent with his training, which he received in both the United States and Britain. He has a bachelor's degree from the University of Maryland and master's and Ph.D. degrees from the London School of Economics.

Active in TRB committee work since 1978, Lewis is a member of the Group 1 Council—Transportation Systems Planning and Administration, and is a member and former Chairman of the Committee on Specialized Transportation. He is also a past member of the NCHRP Project Panel on Cost-Effectiveness of Transportation Services for Handicapped Persons.

Lewis's honors include the 1992 William G. Bell Award from the TRB Committee on Specialized Transportation for outstanding leadership in the field of specialized transportation, and Harvard University's *Journal of Policy Analysis and Management* 1984 Saltzman Prize for Economic Literature. A regular contributor to academic journals and the trade press, Lewis says that he now has a book on benefit-cost analysis in the works and that eventually he hopes to teach. "But for now," he concludes, "I am content to serve the needs of my clients."

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various other organizations. "It is through this interaction and information exchange at the national level that we become aware of many new cost-effective technologies," he explains.

One committee activity he found particularly rewarding was serving as Secretary to the Task Force that produced TRB's *Transportation Research Circular 386: Innovative Contracting Practices*. This study was the result of a public-private sector cooperative effort looking into state, national, and international contracting technologies.

Donnelly is a current member of TRB's Group 5 Council—Intergroup Resources and Issues, and also serves on the committees on Pavement Rehabilitation, General Asphalt Problems, and Frost Action. He was formerly Chairman of the NCHRP Project Panel on Determination of Asphaltic Concrete Pavement Structural Properties by Nondestructive Testing.

He also serves as Chairman of the TRB Committee on Conduct of Research. Donnelly organized a mid-year workshop on the subject, attended by administrators, technicians, and marketing experts from various disciplines within the research community as well as others from research organizations. One of the workshop recommendations calls for the development of a publication describing proper research methodologies. Donnelly believes that the research community needs to understand correct practices so that users can be given a product that is truly state of the art.

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quality has the potential to foster positive changes to traditional ways of doing business. The nation's highway users and the industry itself will be the ultimate beneficiaries of such improvements

For further details on lane-by-lane rental during construction, see "Lane Rental: An Innovative Contracting Practice," in *TR News* 162, September–October 1992 (pp. 7–9).