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CONTRACTOR'S VIEW OF OPTIMIZING MATERIALS AND ENERGY

The Associated General Contractors (AGC) of America, an organization in which I serve as chairman of the Highway Division, represents the people who actually use the energy and put in place the materials, the conservation of which was the subject of this workshop. It is an important and timely subject. The supply of materials and energy is a major concern throughout the country. We have not yet, however, received many indications from our members that they have had problems getting materials and fuel. This is not to say that contractors are not looking ahead. We do as much of this as do most businessmen, particularly those of us in highway construction who have so much invested in equipment. This is to say though that we have a great deal of confidence in our ability to get the job done under almost any circumstances. (As you know, we worry about getting the job in the first place.) Nevertheless, the shortages we faced a couple of years ago did teach most contractors a lesson, and some of the things we learned at that time are appropriate to this discussion.

Shortages and the necessity they create to conserve and make optimum use of what we have should be on every contractor's mind these days. There are some early warning signals that shortages of the past may be pale compared to shortages to come. The signals to which I refer are the normal business cycles that swing through the supply sector of the construction industry, the cycles in which suppliers and manufacturers keep ahead and then fall behind demand. The sharp slowdown in expansion plans in the asphalt, cement, and steel industries is of real concern as we look ahead to coming business opportunities. The extremely high cost of money to finance inventories affects stocks of materials of both manufacturers and suppliers.

The shortages of 2 years ago started a transformation in the long-established ways of doing business in highway contracting and other construction fields. Certain broad categories of change can be ascertained.

1. Older, established contracting firms have the most stable growth in difficult times. Established contractors have proved their business ability. They have built lines of credit and solid relations with suppliers and others with whom they do business. They are less likely to be caught in a situation from which they cannot recover.
2. Newer firms and firms out to make a quick turnover will find it tougher to get new business. Although construction will always—and should always—encourage new entrepreneurs, these firms are going to find it harder to operate profitably. In some cases, it may be difficult to obtain suppliers. Capital loans to them will be less attractive. The construction industry's reputation as an easy-to-enter business will likely change. The industry is getting more sophisticated each year.
3. Suppliers will find contractors taking a harder stand for firm prices. Contractors are adopting new methods of dealing with suppliers, particularly in the matter of receiving quotations. Quotations agreed to and accepted over the phone will be in-

creasingly recognized as a form of contract, and contractors will be more insistent that these prices be firm or a maximum escalator be included.

4. Creditors can be expected to give higher ratings to contractors who have remained solvent and profitable during the present economic crisis.

There are still other examples. Contractors who are operating successfully today have been doing a good deal of belt tightening. They have been reevaluating projects in terms of completion times. In highway construction, the prospect of so-called staged construction is becoming more acceptable to shorten the time between start and completion of a given project.

Actions of the government and other contract-awarding agencies and owners to permit payment for fabricated materials stored on or near the job site have encouraged contractors to purchase supplies well in advance of need in order to have them on time and at the price planned for the job. This is one of the major ways contractors are surviving today's cost crunch. At the same time, the necessity for doing this makes the contractor a possessor of inventory and therefore more dependable in terms of completion schedules.

Purchasing policy of many construction companies has long been a problem, not only to the industry but to suppliers as well. Contractors are not solely to blame for their past purchasing practices. Owners and awarding agencies must speed up the award of a contract. If contractors can place equipment and material orders within 30 days after bid openings, a number of problems would lessen. For one, the cost submitted in a bid would be more likely to hold up by the time of award. For another, it would help halt the need for escalation clauses by suppliers.

Another way to survive in these times is to urge owners to speed up payments. Slow payment policies and payments that are held up to enable the owner to take advantage of the high return on short-term investments do a serious injustice to the contractor. In the long run, the owner does not really gain from such practices, for contractors must include the cost of this money in their bids.

Delays cost money, especially the delay between bid opening, contract award, and notice to proceed. These delays can be prevented by cooperation between the parties to the contract.

These are a few things that can relieve some of the cost pressures that a general contractor faces in the normal course of doing business. There are, of course, a number of things that a contractor can do to get better job performance.

Some policies that were established by general contractors in times of shortage could be well followed at all times. Of necessity, these policies concern the use of equipment more than the use of materials, although I will comment on materials later. AGC compiled the following checklist during the oil embargo and furnished it to all members as a guideline during that crisis period. It should continue in force, however, as good business practice.

Office

1. Reduce night lighting to minimum necessary for proper security.
2. Maintain office temperature at no more than 68 F (20 C) during working hours.
3. Prohibit use of portable electric heaters in office.
4. Reduce energy consumption for interior lighting by turning off lights when not needed, using lights that require less energy, closer matching of amount of light used to amount of light needed, and using sunlight whenever possible.

Company Vehicles

1. Drive at slow speeds until engines warm up (cold engines consume more gasoline than warm engines).
2. Shut off engines when not in use.

3. Maintain proper tire pressure (low pressure can increase gas usage by as much as 10 percent).
4. Place company automobiles on a strict, periodic tune-up schedule [10,000 to 15,000 miles (16 000 to 24 000 km)] (an out-of-tune engine can lower gas mileage by 10 percent). Inspect hoses, nozzles, and tanks for leakage.
5. Keep records of gasoline mileage for company automobiles.
6. Monitor gasoline charge-out records to identify and control any excess use.
7. Restrict use of company vehicles to company business.
8. When vehicle replacement is necessary, replace with high-economy vehicle.

Equipment

1. Do a better job of matching equipment to the job (a bucket that is too wide or too narrow is energy inefficient).
2. Improve earth-moving techniques. Maintain short-haul distances and smooth haul roads. Do not move dirt twice, and try not to move any extra material. Keep air filters clean. Check the fuel injection system. Be on the lookout for burned intake and exhaust valves.
3. Make sure tires are properly inflated and that crawler tracks are properly adjusted.
4. See that operators are trained and motivated to look for machine efficiency and fuel conservation.

Field

1. Consolidate material deliveries and reduce job-site deliveries to one per day, if possible.
2. Reduce on-site lighting (60-W bulbs are suggested for hallways and other areas not requiring high-intensity lighting) but remain in compliance with requirements of Occupational Safety and Health Administration.
3. Shut off rather than idle equipment, particularly during shift changes and lunch.
4. Extend time for oil change, when possible, depending on conditions (some contractors feel more frequent filter changes will prolong time between oil changes).
5. Use proper equipment for long-distance material hauling (small vehicles or other improper equipment may consume large amount of fuel on long hauls).
6. Use maximum daylight hours for construction activity.
7. Plan the locale of strategic lighting equipment and the operation of pumps and motors required for certain air pollution control devices. Monitor these operations on a day-to-day basis.
8. Implement scheduled maintenance programs for both gasoline and diesel equipment (calibration of pumps and injectors is necessary to get proper combustion and reduce excessive fuel consumption). Wash air cleaners, turbos, and lines.
9. Use double covers for concrete heating. Heat only to bare minimum according to specifications, and shut down on warm days. Do not heat longer than necessary.
10. When temporary heat is required, check all areas to prevent heat loss.
11. Conduct periodic "energy audits" to determine further conservation measures.
12. Conserve job-site visits and inspections.
13. Do not fuel rental equipment unless authorized by main office.
14. Give project manager responsibility for all petroleum products deliveries, disbursement, and accounting.
15. Make only one morning and one afternoon parts delivery to main facility and job site.

Conservation Measures Requiring Federal, State, or Local Variances

1. Use higher sulfur fuels or blends for hot-mix plant operations (this would release a large amount of diesel fuel for vehicles rather than for use in drying aggregates).
2. Use solid fuel salamanders for cold weather building heating.

General Policies

1. Encourage better commuting habits by (a) providing prime reserved parking spaces for

car pools, (b) providing clearinghouse service for matching prospective car poolers, and (c) providing up-to-date information on all mass transit system schedules.

2. Adopt mandatory 55-mph (88-km/h) speed limit on all vehicles.
3. Use "buddy" system for lunch and remote job sites.
4. Consolidate supervision if possible to reduce vehicle use.

Two years ago, AGC participated with the American Association of State Highway and Transportation Officials and the American Road Builders' Association in the preparation and publication of a booklet, Cost Cutting Suggestions on Highway Construction. I feel that the suggestions fit perfectly with at least 2 objectives of this workshop: identification of current and innovative construction practices to use materials efficiently and to conserve energy. I might say, too, that I was a member of the subcommittee that developed these recommendations, so I take some pride in the authorship. The following are the 12 suggestions we made for cutting costs in highway construction.

1. To permit the placement, consolidation, and finishing of portland cement concrete without the aid of preerected side forms in the construction of pavements, median barriers, curbs, and gutters, it is recommended that restrictive specifications requiring fixed-form construction be replaced with provisions allowing the option of using slip-form techniques. It is also recommended that the requirements for reinforcing steel be simplified to the maximum extent possible, particularly with respect to median barriers.
2. To standardize bridge components, it is recommended that the use of prefabricated bridge components be increased.
3. To simplify the use of materials conventionally used in highway construction, it is proposed that precast inlet and manhole standard details be developed and included in contracts as acceptable alternatives and it is recommended that these standards be used as alternate construction bid items.
4. To meet rather stringent gradation requirements in specifications involving soil and aggregate materials, it is proposed that additional efforts be made to use naturally occurring material with a minimum of costly processing.
5. To permit alternative designs involving various pipe products, it is proposed that, wherever site conditions will permit, alternative designs be prepared for all types of pipe that can be expected to perform satisfactorily and are reasonably competitive in price and the least costly alternative be selected for use, the costs being determined by the competitive bidding process.
6. To provide for the elimination of transverse reinforcing steel in continuously reinforced concrete pavement in an effort to take advantage of modern developments in paving equipment technology and to reduce unit costs of pavement, it is recommended that standard contract provisions be adopted to permit the elimination of transverse steel wherever possible.
7. To implement the concept of a flare-end section on pipe in lieu of headwalls, it is recommended that a standard plan or plans for such flare inlets, including structural and hydraulic considerations, be developed.
8. To standardize the details of highway elements on a nationwide basis, it is recommended that each state highway department and the respective contractor associations review what immediate and further actions could be taken to increase standardization of details in their plans and specifications.
9. To substitute latex, acrylic, and polyester coatings, or no treatment, in lieu of rubbing concrete structure surfaces when such surfaces require some treatment, it is recommended that rubbing of exposed, formed surfaces of concrete structures be eliminated and that finishing consist merely of plugging tie holes and removing fins or other protrusions. In some cases a higher finish may be desired and in such cases it is recommended that a coating of latex, acrylic, or polyester material be used.
10. To minimize geometric complexities in bridges, it is recommended that a comprehensive and diligent analysis be made of the entire project at the preliminary design stage.

11. To establish that thick lift bituminous paving, commonly known as black base, should not be regarded in the same light as surface course paving, it is suggested that a reassessment and broadening of the specifications be made with the thought that this is base course material.
12. To encourage the use of the dryer drum concept to produce hot emulsion mixes, it is recommended that the film, The Dryer Drum Process, produced by the Federal Highway Administration, be shown at contractor and contractor-state meetings to familiarize them with the process and the suitability of the product.

Finally, I will say a word about what happens when shortages occur and pricing policies change radically. These 2 conditions have a significant bearing on how a contractor performs and consequently have a direct relation to this discussion. When these conditions occur, some contractors make a fast call for escalation clauses in their contracts. These clauses are considered to be protection against runaway prices. Interestingly, Associated General Contractors has not endorsed escalation clauses. In fact, AGC has steadfastly maintained its long-held opposition to escalation clauses, which would surely have harmful long-term effects. Nevertheless, contractors feel that, if any future price aberrations should suddenly occur, general contractors must insist on the following responsibilities of suppliers:

1. Quotations to general contractors must be firm and void of price-in-effect clauses or unlimited escalation clauses. If it is anticipated that prices will rise during the term of a contract, any escalation clause should specify an upper limit above which the price will not rise.
2. Quotations, whether written or verbal, must be adhered to by the subcontractor or supplier.
3. Contracts must be honored regardless of future factors affecting price.

In recommending this, general contractors recognize the dependency and trust we must place in our subcontractors and suppliers. We recognize further that they, through all tiers, should be more expert than we are in assessing the effects of all factors on their work and pricing structure. And we expect subcontractors and suppliers to exercise their responsibilities to the industry and to the contract system.