INTRODUCTION

For several years we have experienced varying degrees of shortages of materials and fuels needed for highway construction and maintenance, with resulting uncertainties on prices and dates of deliveries of these items.

Prior to the events of the Middle East, we were anticipating a modest oil shortage in the neighborhood of three to five percent. Now, with the Middle East embargo on oil shipments, it looks as if we are subject to a 15 to 20 percent shortage.

Each year the federal-aid highway construction program uses about 14.1 million barrels of fuel and employs or creates work for about 1,250,000 people. This represents about 42 percent of all road and street construction. It is very difficult to make specific statements concerning the measurable impact of fuel and materials shortages on highway construction. Part of the problem in getting valid data on the magnitude of the impact is the extreme variation in supply situations in the various geographical areas and the speed with which changes occur. The severity of shortages seems to vary from week to week for many items in some areas.

Most of the contractor groups with whom we have discussed the situation tell us that the shortages are causing them serious problems in obtaining firm price quotations and delivery promises from suppliers, and this is affecting their ability to bid on new projects. There are
numerous instances of time extensions being granted on ongoing projects because of delays in the delivery of fuels and materials.

An analysis of the number of contract lettings, month by month, over the past two years for federal-aid projects, does not show any identifiable trend or significant impact as yet on highway construction. We are aware that this is the slow season of the year, and we expect the real impact will begin to show itself in the next few months as weather conditions improve.

We believe it is important to discuss what has happened to highway construction because of the shortages and the actions the Federal Highway Administration, the states, and contractors have taken and can take to cope with the problem.

FUEL SHORTAGES

Allocation of Fuels

The number of ongoing construction projects being delayed by fuel shortages is increasing at an accelerated rate. Some 32 states have reported shortages of fuel in highway construction. Two have reported severe shortages, five have reported critical shortages, and 25 states report moderate shortages. Several states have canceled or delayed project lettings due to the inability of contractors to obtain quotes on fuel prices or guarantees of deliveries. We estimate that between 500 to 1,000 highway construction projects have been interrupted by fuel shortages.

The system for allocating fuels to suppliers and end users, formerly prescribed by the Federal Energy Office for industrial users in general, has caused some serious problems in the contract construction industry. Allocations to industrial users of fuels, including construction contractors, are based on the quantities used during the corresponding month in 1972 for gasoline and diesel fuel, and on other base periods in 1972 for propane and butane. This is inequitable to many construction contractors, because of the mobility of the industry and the wide variations in fuel usage by individual contractors in previous years due to factors such as location of projects, workload, type of construction, and weather conditions. Under this allocation system some contractors by chance are fortunate and have an adequate fuel allocation base, others do not have enough for prospective work. This has had serious implications for the competitive bidding process since contractors just were not competing on an equal basis for projects.

In recognition of this problem, the Federal Energy Office in its mandatory Petroleum and Price Regulations, published in the Federal
Register on January 15, 1974, has included a special provision, Section 211.27, for the construction industry. Under Section 211.27 of the regulations, contracting agencies planning to award a construction contract under competitive bidding procedures may apply to a supplier for an allocation of fuels in an amount sufficient to complete the project. Upon awarding of the contract the allocation for the project must be transferred to the successful bidder.

The Federal Highway Administration is urging all contracting agencies planning to advertise for federal-aid highway construction projects to obtain allocations of the fuels to be needed for the individual projects, for transfer to the successful bidder upon awarding the contract. It is felt that this will place all prospective bidders on an equal footing on a project-by-project basis, insofar as fuel requirements are concerned, and it will help to reduce delays in completing projects because of inadequate allocation of fuels available to the contractor.

When a contractor is given an allocation of fuels for a construction project under Section 211.27 of the Federal Energy Office regulations, he can expect to receive 100 percent of his current requirements during the course of the construction work. However, I must point out that timely deliveries of required fuels cannot be guaranteed, as there is a possibility that the contractor, just like other priority users entitled to 100 percent of current requirements, may receive a reduced quantity of fuel in those months when the supplier's monthly deliveries from his wholesaler or supplier are reduced because of a general shortage. In other words, if a supplier should receive a reduced quantity of fuels in a particular month, he must apportion his available supply among his customers.

Revenues from Fuels

Another long-term problem facing all highway construction and maintenance programs is the reduction in revenues from fuels. At present gasoline is being used at a rate of about 85 percent of last year's usage, and a national speed limit of 55 mph has been imposed. These factors alone will probably reduce gas tax revenues by 15 to 20 percent. In most states, this will immediately affect the amount of state funds used to match federal-aid funds. We anticipate a national program reduction of 15 to 20 percent unless something is changed in the financial picture. One state has proposed increasing the federal share of ABC projects from the current 70 percent to 85 percent. The extra funds would come from previous impoundments of Trust Fund monies. This
type of action would, of course, require congressional legislation which is highly speculative.

The sharp decline in revenue from gasoline taxes and other imposts on highway users simply means that substantially less money will be available, at all governmental levels, for highway improvements, maintenance, and administration.

**Actions Taken to Conserve Fuels**

Early in December 1973 the FHWA issued instructions to its field personnel requesting them to meet with appropriate state officials to review and identify actions that could feasibly be taken under prevailing conditions to effect reduction in fuel usage on ongoing and future federal-aid highway construction projects. The Federal Highway Administration encourages and will accept design proposals and change orders that will effect fuel savings without undue sacrifice in the timeliness, quality, or cost of such construction. Some suggested actions are the reduction in use of cutback asphalts, lowering of mixing temperatures for bituminous mixtures, carpooling of construction workers, etc.

A study of fuel consumption on various types of highway construction shows that fuel consumption per million dollars on rural construction is approximately twice that of urban construction. Grading and drainage are the highest users of fuel and manpower. This information was furnished to field offices on December 27, 1973, to provide guidance for making a judicious selection of projects yet to be advertised for bids, to modify designs as appropriate, limit the size of projects, construct the projects in stages, etc. Special consideration should be given to specific types of projects that will result in the significant conservation of fuel to the road user after construction, as well as requiring less fuel per million dollars to build. Some examples are: structures, TOPICS projects, urban projects, safety improvement projects and exclusive bus lane projects. Efforts are being made to provide a mix of highway projects which will conserve fuel while avoiding serious adverse effects on employment, highway construction stability, traffic flow and safety.

On January 17, 1974, the FHWA issued an instruction inviting the attention of field offices, states, and local governments to the overall fuel savings that are possible by using emulsion asphalts in lieu of cutback asphalts for highway construction and maintenance operations. This has the potential of saving 300 million gallons of naphtha and kerosene each year.
Several contractors' organizations such as the Associated General Contractors, the American Roadbuilders Association, the National Asphalt Paving Association, and the American Concrete Paving Association have urged their members to practice fuel saving measures in connection with their work. NAPA has published a pamphlet entitled "Fuel Conservation" in which they estimate an 18 percent shortfall of fuel availability for asphalt hot mix production in 1974. In the pamphlet they make positive suggestions for ways to save as much as 22 percent of the fuel needed, by such methods as: reducing use of cutbacks, reducing amount of diesel oil sprayed in truck beds, salvaging used oils or other volatiles and mixing them with other fuel, shutting off engines when not in use, improving drying techniques, reducing mix temperatures, and better plant maintenance.

MATERIALS SHORTAGES

The Problem

Highway agencies and contractors are experiencing increasing difficulties in getting price quotations and timely deliveries of certain materials and products needed for highway construction and maintenance. Widespread shortages exist in reinforcing steel, asphalt, portland cement, and aluminum. Recent reports indicate growing shortages in zinc, used for galvanizing guard rails, fencing, etc., and in titanium dioxide, the pigment used in pavement marking materials.

Information recently obtained from a national survey indicates that 32 states have experienced exceptionally high prices in recent lettings. Bids for items requiring asphaltic materials and reinforcing steel were especially high and widespread among these states—24 reported shortages of portland cement, 28 reported shortages of asphaltic materials, and 29 reported shortages of reinforcing steel.

Portland Cement

The present shortage of portland cement we are now experiencing seems to be caused by the need for large investments to modify existing plants or to build new plants that will conform to strict environmental standards. The profit picture looked very bleak until November 1973 when the Cost of Living Council lifted price controls on portland cement. It is expected that new capital will now be invested in the cement industry though prices will necessarily rise. We expect to see shortages of cement for the next two to three years until new plants are built or existing ones modified.
In January of 1974 the FHWA issued a field instruction encouraging the substitution of fly ash for a portion of the portland cement used in concrete mixes and cement stabilized bases. This should help in lessening the impact of the cement shortage.

Reinforcing Steel

The present shortage of reinforcing steel seems to stem from a combination of price controls holding down profits on these items and the lack of scrap iron. Much of the available scrap metal is being exported to obtain better prices. Export controls on scrap metal and allowing a reasonable profit to the mills for producing reinforcing steel would go a long way toward alleviating this problem.

Asphalt

Asphalt is in short supply and probably will get scarcer. There is a very serious problem here because research is under way to develop better ways of obtaining more fuels from crude oil, thus leaving a smaller volume of asphalt residue. It is possible to mix light fuels with asphalts to obtain heavier oils such as No. 6 heating oil. We are concerned about the possibility of asphalts disappearing from the market.

The mandatory petroleum allocation regulations promulgated by the Federal Energy Office on January 15, 1974, specifically excludes asphalts from the coverage of the regulations. The FHWA, the National Asphalt Paving Association, and other organizations are urging the Federal Energy Office to establish a minimum asphalt production level to prevent catastrophic shortages. About five million tons are needed each year just to maintain existing highways, and it is estimated that about 18 million tons will be needed for construction purposes in 1974.

Certainly the asphalt business is a very major part of the national roadbuilding and maintenance program. Of the 3,786,700 miles of the existing road system in the United States, 1,737,500 miles have hard surfaces. About 1,621,000 miles or 93.3 percent of the surfaced mileage is surfaced with asphalt. We cannot afford to further aggravate the shortage of this material. Two AASHTO Subcommittees—Construction, and Maintenance—are jointly conducting a study on asphalt usage in order to prepare a statistically sound, defensible case to be presented to the Federal Energy Office.

Critical Materials Needed for Ongoing Projects

The Defense Materials System and the Defense Priorities System, administered by the U.S. Department of Commerce, cannot be used
for directing the production and flow of critical materials into highway and maintenance projects. Priorities cannot be obtained for the procurement of materials needed for highway work.

In exceptional situations where scheduled completion of an important highway project is jeopardized because of the inability of the contractor to get delivery of an essential material or product, the Department of Commerce might be able to give informal assistance in expediting delivery.

The FHWA has issued instructions on the procurement of critical materials, urging contractors to place orders as early as practicable so that producers and suppliers may have a longer lead time in filling orders. If efforts to assure timely deliveries of essential items are unsuccessful it may be necessary to consider design modifications or the use of acceptable substitute materials.

GENERAL COMMENTS

Impact of Shortages on Maintenance Programs

Because of shortages of fuels and materials needed for maintenance work, highway maintenance organizations have been forced to reduce and even to curtail certain services and operations. In general, top priority is given to maintenance of pavements and structures, but less attention must be given to many activities involving physical maintenance and traffic services because of shortages of materials and fuels. This belt-tightening situation makes it imperative that highway maintenance organizations examine the management of their programs in order to do the most effective job under the circumstances.

Incidentally, the Federal Energy Office regulations governing the allocation of fuels do not specifically provide for allocations for the purpose of maintaining highways. The FHWA has made a strong representation to the Federal Energy Office, stating that it is absolutely essential that provision be made for the procurement of an adequate quantity of fuels needed to preserve the tremendous investment in roadways and to maintain the operational efficiency and safety of highway transportation facilities.

Price Adjustment Provisions in Construction Contracts

Current shortages of fuels and construction materials are resulting in unreasonably high bids in some cases as bidders seek to minimize their risks in relatively long-term commitments. The FHWA is working with the AASHTO Subcommittee on Construction to develop guidelines and suggested contract provisions to offset the bidding risks
resulting from uncertainties about material and fuel prices and availability. These provisions (sometimes called "escalation clauses") would permit payment to be made to contractors on the basis of actual cost or on the basis of an adjustment to the bid price. An increasing number of states have expressed interest in adopting contract language of this nature and at least four states have included price adjustment or contingency clauses in contracts for federal-aid projects.

**Effect of Shortages on the Present Construction Program**

The actions taken to date by the FHWA, AASHTO, contractors' associations, and governmental agencies, should reduce the consumption of energy and critical materials by better utilization of these resources and more effective management. These efforts will undoubtedly conserve fuels and materials and, at the same time, enable the federal-aid construction program to proceed at present funding levels. It is hoped that no drastic highway program reductions will take place in the foreseeable future other than the decline that may be expected because of reduced tax revenues from sales of gasoline and diesel fuels. The magnitude of such a program reduction is of course uncertain.

**Impact of Possible Major Construction Program Reductions**

The FHWA has studied the impact of severe reductions in the size of the highway construction program, in the event such action becomes administratively necessary. Six possible options, providing for various degrees of slowdown, have been studied. These options range from complete program shutdown to placing contractors on a four-day work week.

All of these possible actions would seriously increase unemployment. The federal-aid highway program provides direct employment for more than 500,000 people, and the buying power of these people in turn creates jobs for another 780,000 people. The combined employment generated by the federal-aid highway program is thus well over one million jobs. Going to a four-day work week would eliminate over 10,000 jobs while saving about 700,000 barrels of gasoline and 2.1 million barrels of diesel fuel annually. A complete construction program shutdown would eliminate over 1.25 million jobs while saving about 3.5 million barrels of gasoline and 10.6 million barrels of diesel fuel. (Incidentally, this is less than one half of one percent of the total national consumption of fuels.)

Consequently, of the program options studied, we have concluded that if it becomes imperative to slow down the federal-aid highway
program, it can best be done by shortening the work week. This will conserve fuel and other critical materials in short supply while having a relatively light adverse impact on employment, and a minor reduction in benefits that can be expected from full-time highway construction.

CONCLUSION

The cooperation shown by the governmental agencies concerned with highway construction and maintenance, and the contractor groups, in facing up to the problems caused by fuel and material shortages is heartening. We believe that continued mutual cooperation, trust, and an aggressive fuel conservation program by all concerned is in the best interest of the highway industry and the nation. The problem is serious but we view it as a challenge to be overcome, and the industry was built on great challenges.