Fiber Optics and Interstate Freeways—The Federal Perspective

■ JAMES A. CARNEY

The recent changes in Federal Highway Administration (FHWA) utility accommodation policy and the possibility that the Interstate Highway System may be used for fiber-optic communication networks have certainly increased interest in utility-highway accommodation issues. These changes have resulted in some misunderstandings. In this report, I will discuss some of the issues and concerns dealing with utility-highway joint use. Perhaps this will lead to a better understanding of our utility accommodation practices and the policy changes.

Three general areas will be covered:

- General road characteristics and why we have utility accommodation policies
- The history of utility accommodation policy development and implementation
- Current utility accommodation issues and future directions.

Why Have An Accommodation Policy?

There are approximately 3.9 million miles of public roads and streets in the United States. In 1986, there were 176.2 million registered motor vehicles and 159.5 million licensed drivers. It is common practice for public utilities to locate their facilities on public road right of way. How many miles of utility lines are located on roads and streets is anyone's guess. Some estimate that 88 million or more utility poles are located on highway right of way.

Not all roads or their uses are the same. This enables us to classify roads using a functional classification. All roads are now classified as principal arterials, minor arterials, collectors, or local roads. These can also be broken down by urban or rural and by various highway systems. To one degree or another each of these breakdowns are also indicative of differing types of usage and impacts. For example, interstate highways fall under the principal arterial classification, while in all likelihood the residential street you live on would be listed as under the local classification.

Federal-aid systems represent only 21.8% of all road mileage. However, they carry 80.7% of all traffic. A further refinement would show that the Interstate Highway System represents only 1.1% of the nation's road mileage but carries 21.3% of the traffic. Therefore, the safety and efficiency of most highway travel in this country can be determined by how we design and operate a relatively few miles of the nation's roads and streets. For the most part these major roads are on a federal-aid highway system. We therefore approach major policy decisions affecting the nation's federal-aid systems with caution.

There are many ways to analyze road use statistics. What I want to do is compare freeway characteristics with other roads and streets. First, let's define the term "freeway" as follows:

A fully controlled access divided arterial highway for through traffic with no at-grade intersecting roads or direct private driveway connections from abutting property. Access connections to the through traffic lanes are provided at selected public road interchanges.

Nonhighway uses of freeway right of way are also limited and permitted only when they will not interfere with the highway and its safe use. Generally, the travel ways of freeways are sufficiently removed from the distracting effects of abutting property uses. Consequently, freeways are generally unencumbered by conflicts resulting from nonhighway-related activities. The modern freeway may be viewed as a self-contained system, within a protective envelope, whose principal or sole function is the safe, efficient, and rapid movement of large volumes of traffic between major traffic generators and distribution points.

On the other hand, nonfreeway roads and streets serve the general public in a much broader sense. For the most part these facilities are land service roads.

The design standards for nonfreeway roads are for the most part much lower than for high speed freeways. Nonhighway uses, such as public utilities, often are located on and serviced from the limited right of way. Often, underground utilities must be serviced from manholes located within the paved surface of streets. Adjacent land uses can often result in distractions to the traveling public. Road intersections are generally at grade. In short, nonfreeway roads and streets provide more opportunity for vehicular conflicts of all kinds.

Certainly, the Interstate Highway System must be maintained and upgraded where necessary. This system should be viewed as a national resource of the first order. Its function and integrity should be preserved if it is to effectively serve the nation's transportation needs safely and efficiently into the 21st century. Many of the nation's nonfreeway road facilities clearly must be upgraded to higher standards and improved to enable them to better handle the increasing demands on these systems and improve highway safety.

Also, since highway safety can be affected by how nonhighway uses of road right of way are permitted, policies and procedures for controlling such uses are necessary in addition to road improvements. For example, utility poles are second only to trees

James A. Carney is Chief, Railroads, Utilities and Programs Branch, Office of Engineering, Federal Highway Administration, Washington, D.C. Mr. Carney has been with the Federal Highway Administration since 1959, serving in various engineering capacities in Texas, Oklahoma, Arkansas, Florida, and Kentucky.

> In general, utilities are permitted to cross freeway right of way provided they can be installed and serviced from other than the freeway main lanes and ramps.

as the most frequently struck roadside obstacle in fatal accidents.

Also, the servicing and maintenance of utility facilities on highways is hazardous. Utility crews working on road and street right of way face the same dangers as road construction and maintenance crews. Construction and maintenance zone safety is a major problem.

Utility/highway safety problems are principally a concern on nonfreeway facilities where utility use of road and street right of way is more common. The nation's freeways are relatively free of utility related accidents because utilities are generally permitted thereon only under very carefully controlled conditions.

History of Utility Accommodation Policy Development and Implementation

It has been common practice for public utilities to routinely use and occupy road and street right of way. The purpose and function of most roads is to provide a means for transportation access to abutting properties. Utility facilities located on such land service roads provide adjacent property owners necessary utility services. The FHWA has long held that the use of public road and street right of way by essential public utilities is in the public interest when it can be done safely and in a manner that does not impair the road or its use.

Highway/utility accommodation policies and practices have evolved over the years. For example, national uniformity in utility accommodation policy for freeways occurred as a result of the interstate highway program enacted by the 1956 Highway Act. At the very beginning of this program, the nation's road officials had to make major decisions on how the interstate system would be developed and designed. One of the first decisions was that it must be fully access controlled. Once this decision was made, others followed. The American Association of State Highway Officials (AASHO) (now the American Association of State Highway and Transportation Officials [AASHTO]) issued a policy statement on August 7, 1959, entitled, "A Policy on the Accommodation of Utilities on The National System of Interstate and Defense Highways." This was adopted by the U.S. Bureau of Public Roads (now the FHWA) on September 30, 1959, as an interstate design standard. This policy developed by state highway officials has been periodically reviewed and reaffirmed. The FHWA accepted the latest version of this AASHTO policy on May 7, 1985. The policy covers a number of items, but its principal features deal with conditions controlling public utilities' use of freeway right of way within the control of access lines. In general utilities are permitted to cross freeway right of way provided they can be installed and serviced from other than the freeway main lanes and ramps. Utilities existing at the time of construction of the freeway are permitted to remain on the right of way only if they meet this access test. New longitudinal utility installations within the control of access lines are permitted only under special circumstances as extreme case exceptions and then only where they can be installed and serviced from other than the main lanes and ramps. The net affect of this policy, which has controlled the development of the interstate system to this day, has been to discourage utility installations on freeways within the control of access limits. Considerable amounts of highways funds have been spent relocating utility facilities and other nonessential facilities outside of the control of access lines. Consequently, freeway rights of way are relatively uncluttered and free of nonhighway uses of any kind.

With development of the modern highway systems after World War II and the growing use of automobiles, many problems of the nation's road systems became evident. In the mid-1960s, AASHO conducted a study on highway safety issues. It

issued a special report entitled "Highway Design and Operational Practices Related to Highway Safety" in February 1967. This led to an increased interest in improving procedures and practices related to highway safety matters. One of these issues dealt with the effect that public utilities had on highway safety and the adequacy of controls of utility use by highway authorities.

This resulted in the issuance of a federal regulation under 23 CFR 645, Subpart B, which required state highway authorities to develop adequate procedures controlling utility use of federal-aid highway right of way. This process established in the late 1960s is the one followed today. Specifically, each state highway agency was required to develop its own utility accommodation policy it planned to follow on federal-aid highway projects. These policies were approved by the FHWA where they adequately provided for the safety of the traveling public and preserved the integrity of the highway and its future use. Individual utility permits or applications to use the right of way of any federal-aid project could be approved by the state highway agency without referral to the FHWA if the proposal was in accord with the approved policy. This applied to both interstate freeway projects as well as nonfreeway projects. An exception to this nonreferral provision were proposals to install utilities longitudinally within the control of access lines of freeways. Until the most recent FHWA regulatory change of February 2, 1988, these longitudinal freeway use proposals had to be submitted to FHWA for prior approval as extreme case exceptions under the AASHTO Utility Accommodation Freeway Policy.

The Fiber Optics rule requires each state highway agency to develop a utility accommodation policy.

The February 1988 rule change is commonly called the Fiber Optics rule. This rule change, after all is said and done, is rather simple. Specifically, it requires each state highway agency to develop a utility accommodation policy setting forth its policy for permitting utility use of freeways. This policy is approved by the FHWA if it is satisfied that the state's policy adequately provides for the safety of the traveling public. Individual utility proposals for the use of freeways are not submitted to FHWA for approval. It is a state's responsibility to assure that these proposals are in accord with the approved freeway accommodation plan. Extreme case exception requests on freeways would no longer be submitted to FHWA for approval. In substance, this places all utility freeway installations under the same administrative process as all other utility proposals have been under since the late 1960s. After the issuance of this rule, FHWA is not involved in reviewing individual utility permits on freeways or any other federally funded road projects. The FHWA's role is limited to reviewing and approving state policies and plans.

The state highway agencies are currently considering freeway utility accommodation policy modifications. The change in the federal rule on utility use of freeways has caused considerable activity in the utility accommodation area. The federal rule clearly provides more flexibility to the state highway agencies. The AASHTO Utility Accommodation Freeway Policy is no longer federally mandated as a standard. The rule is more open as compared to what many considered a rather closed policy governing such matters for the past 30 years. The states must now decide whether they want utilities on freeways and, if so, to what extent and under what conditions.

It appears that most states are approaching increased utility use of freeways with considerable caution. The issues surrounding utility uses of freeways have not changed. For example, there has been a substantial investment of both public and private resources in support of the AASHTO Utility Accommodation Freeway Policy. Construction of the 42,800 mile interstate system will require an in-

It appears that most states are approaching increased utility use of freeways with considerable caution.

vestment of more than $120 billion in federal and state funds. It is estimated that the total cost to highway agencies and utility companies for utility adjustments associated with building the interstate system will be in the $3–4 billion range. A significant portion of these utility adjustment costs can be attributed to additional utility adjustments or relocations necessary to preclude longitudinal utility occupancy of the freeway right of way within the control of access limits. From a highway standpoint, protection of this investment and preservation of the integrity of the interstate system is a concern. The mere fact that FHWA has removed some mandated provisions from its regulations does not eliminate concerns about the compatibility of utility and highway joint usage of the nation's highest type of highway facility, the freeway. These matters must be addressed and considered by highway authorities before final action can be taken on accommodation policy modification. In recognition that not all freeways and freeway operations are alike across the country variable approaches can be ultimately expected. It will probably be several years before final policy decisions are made by all the states.

In approving a state's freeway accommodation plan, FHWA will give very careful consideration to measures proposed to insure the safety of the traveling public and features to protect the highway. FHWA recognizes the widely varying conditions. Highway safety matters are not the same on a low volume rural interstate highway as on a high volume urban freeway. Considerable latitude may be appropriate on such rural facilities. The nature and type of utility facilities may also differ from area to area. All these variables must be taken into account. It must be noted that there is no such thing as an absolutely safe highway utility installation. The construction, operation, and maintenance of any facility on or near a major high speed highway can not be done without some risk. Considerable judgment must be exercised by highway authorities in determining whether the risks are acceptable and whether all reasonable measures have been taken to maximize the safety of the traveling public. Where there is a question as to the acceptability of any utility installation from a safety standpoint then it should not be approved. The same would apply to FHWA approval of any state's proposed freeway utility accommodation plan.

Current Utility Accommodation Issues and Future Directions

This review by the states of a major highway policy matter is both timely and appropriate. It comes at a time when highway authorities are looking at how they are going to handle postinterstate program needs. This is a proper time to evaluate the policies used to see whether they should be continued or modified to better meet our future road program needs. Therefore, I view this current activity on utility accommodation in a most positive light.

Do we want to change utility accommodation policy because of the new fiber optics technology? The answer to this, in my view is, "no."

It is appropriate in any policy review to look at the history of its development. However, the background discussions along the above lines on roads systems and safety issues are but the first step in the process. This leads to the next step, which is somewhat more perplexing. In this step we must determine the current issues and what changes in policy we now want to make. I will briefly discuss some of these items using fiber optics accommodation issues since these are the driving force behind the current efforts.

- The first question that comes to mind is, "Do we want to change utility accommodation policy because of the new fiber optics technology?" The answer to this, in my view is, "no." From a highway standpoint a fiber-optic cable is not much different in effect than any other cable or low maintenance underground facility. Therefore, the better question is, "Should we adopt a more flexible position on freeway use by those innocuous utility facilities, such as underground fiber-optic cables, that can be easily installed and do not require much maintenance or servicing?" As a practical matter, any individual singular installation of this type placed along the right of way line would normally not materially interfere with routine freeway operations and thus would in all likelihood be reasonably safe from daily operational standpoint. This, of course, leads to the next issue to be considered.
- Can these innocuous, low maintenance, safe, underground utilities be defined? Certainly, fiber-optic cable falls into this category; but others do also. I am sure that many pipeline owners would argue that they can design and install pipeline facilities which would not interfere with the freeway any more than a fiber-optic cable. They may claim that their pipeline would be just as safe and would require less maintenance and servicing than a fiber-optic cable. To what extent do we want to open up our freeways to such use is a question we now need to answer.
- Proliferation of utility installations on freeways could be a problem even if a decision is made to limit new permitted freeway installations to fiber optics. There are many companies who would like to put in cables. Should all of these be accommodated or should a more selective process be used? To what extent can a state limit utility use to just certain utilities? Can a state legally discriminate by prohibiting some and permitting others? Will state law have to be changed?
- If our freeways are opened up for more utility use, what standards of installation and design should be required? Should not these facilities meet the highest of standards consistent with the high standard of the freeway? Should not they be accurately placed at predetermined locations to

facilitate their identification and prevent damage from highway maintenance and reconstruction activities? What degree of accuracy should be required?

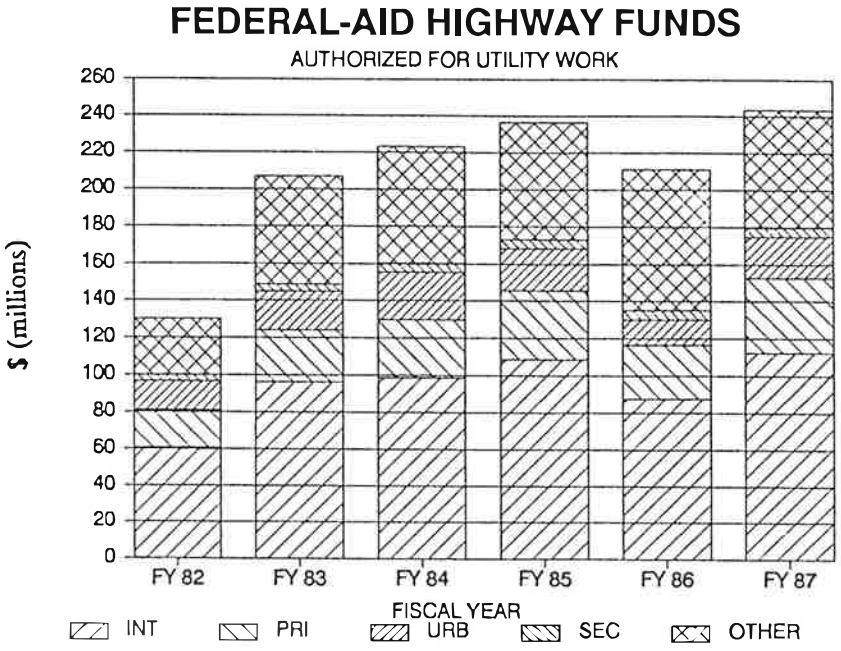
- Since any activity on highway right of way contains elements of risk, can acceptable levels for utility use be defined? This question applies to both freeways and nonfreeways. This is a key issue which needs to be thoroughly considered by all parties. There may not be any one given absolute answer. We must come to grips with the safety issues and develop a better understanding of those things that need to be done and the limitations that must be applied to insure a reasonably safe road environment. There is a clear federal mandate in this regard. The provisions of 23 USC 109(1) place a considerable burden on federal officials to permit only those facilities which do not adversely affect safety. In this regard, to what degree can we promote flexibility based upon different road conditions which may justify different approaches to utility use and still have reasonable assurances that safety will be adequate? What we do on a high volume high speed urban freeway as regards utility use could be different then on a low volume rural freeway. To what degree these types of variable conditions should be considered must be decided.
- Utility use of highways has and always will interfere with the highway and its uses in some manner. This interference varies and is generally considered acceptable and a price that must be paid to provide necessary transportation and utility services to the American public. However, the costs are high. Highway construction cost escalates where numbers of utility relocations are required. Figure 1 indicates the federal-aid highway funds (interstate, primary, urban, secondary, and other) used on an annual basis to adjust utilities. In many instances utilities must pay for the adjustments. Clearly, large sums are expended by all parties each year on adjustments. We are continually involved in means to minimize this adverse impact and cost of these two most essential public services on each other. This potential of adverse impact of utility use must be carefully considered when evaluating a policy change to permit utility installations on facilities heretofore prohibited. What impact will these new installations have on future highway operations and expansions? Will maintenance costs increase? Who will pay for future utility relocation costs? These issues vary from state to state and must be addressed on that basis.

Utility use of highways has and always will interfere with the highway and its uses in some manner.

- Are the states assuming any hidden liabilities by permitting utilities to use highway right of way? Attempts by utilities or damaged third parties to recover loss of business damages from states or highway contractors must be considered. If such liabilities can be applied to the state contractors, this could result in higher bid prices. This may not be a price that state highway authorities are willing to pay if they can avoid it by restricting highway utility use.
- These issues of increased cost and liabilities lead to the question of fees for the use of highway right of way. Federal law requires the states to charge the fair market value for nonhighway use of federal-aid highway rights of way with the proceeds to be used for highway purposes. Utility use of federal-aid highways is specifically exempt from this mandatory requirement. The states, however, may charge such a fee if they so choose. How much of a fee to charge and who must pay and the disposition of the proceeds are matters each state must decide. It may be appropriate for a state to charge an amount sufficient to cover its expenses and potential liabilities it may have to assume resulting from each permitted use.
- Should a distinction be made when determining what utility facilities will now be permitted on freeways as to the nature of utility service? Traditionally, it has been clearly in the public interest for essential public utilities that directly serve the general public to use highway right of way. This includes land service utilities such as water, sewer, gas, electricity, and telephone, which are normally considered essential. Often they are regulated to insure adequate service at reasonable costs. However, deregulation of recent years has resulted in other utility facilities which serve a different use and a more select public. Should these be considered in a different light as compared to the traditional land service public utilities?

These are some of the issues being considered by the states as they review and address the new federal rules. It is not an easy task. There are many questions that need to be answered. Where should this nationwide effort lead us? It is my view that it should result in positive changes on how we handle utilities on our nation's roads and streets. For example:

- There are many miles of rural freeways that will not be expanded in the foreseeable future. Considerations should be given to permitting a limited number of unobtrusive utilities such as fiber optics to be located thereon under carefully controlled conditions. This should be done only where other locations are not as practical and there is a clearly met public benefit such as a substantive savings to the utility or utility user. In such cases the principles of access control must be preserved to the maximum extent possible and interference with traffic on the freeway minimized. On the other hand, for freeways in and around urban places with high volumes of traffic or for freeways where expansion is a possibility, the states should approach increased utility use with some considerable caution. The safety of the federal-aid freeway should not be compromised.
- Improvements should be made in how we provide for utility use of roads and streets. This use is essential to the economy of our country. It is inevitable. However, provisions for such joint use of public road rights of way often are not made or considered in road planning. This should change. If public utilities are to be permitted to



use our roads and streets, then this should be done in a manner conducive to the safety and efficiency of both the highway user and the utility operations. In most cases the key is the adequacy of the right of way to properly accommodate the dual use. Utility and highway authorities should work together to plan and implement road and plant expansions, especially in emerging transportation corridors. If additional right of way is needed, then it should be obtained. The issue of who pays for what in such cases is a matter which must be addressed at the state and local level. The concept of planned joint highway/utility transportation corridors is the way to address utility accommodation matters in the future.

- Existing utility conflicts on many of our major roads and streets need special attention and should be addressed. As utility plants are replaced or road improvements made, solutions to these congested joint use problems should be sought. Where possible, overhead utilities should be placed under ground. Perhaps the consolidation of utilities into utility tunnels may be a long term solution. Where undergrounding is not practical, relocation of the utility facilities to nearby less congested streets may be appropriate. In any event, where existing road and utility joint use are causing problems, both road and utility authorities should work together and develop plans and strategies for alleviating these problems over time. There is no overnight solution. However, we should not let the complexities for which there are no readily available or doable solutions inhibit us from doing what can be done to improve conditions.
- Along these same lines, where highway/utility joint use is causing or is likely to cause highway safety problems, then something must be done. It is imperative that we all do all that we can to improve highway safety. Utility and highway authorities should work together to identify utility safety problems and devise plans for their correction. As with the above road congestion issues, there are no easy overnight solutions. Highway authorities cannot readily chop down all trees or improve all guardrail on 3.9 million miles of road. Also, utilities cannot be expected to relocate, bury, shield, or install breakaway devices on 88 million utility poles. What is clear is that trees, utility poles, and guardrails are the most frequently hit roadside objects. By making these more safe, we will contribute significantly to improved highway safety.
- We should look for ways to make highway joint use by utilities more efficient and less obtrusive. Fiber optics technology may play a leading role in this regard by facilitating conversions of overhead facilities to underground. Also, fiber-optic cables could facilitate more joint pole use with power lines thus reducing poles along road rights of way. The advantages and benefits of the new fiber optics technology should result in a safer and less obtrusive telecommunications system across and along our nation's highways.

These are some of the current issues being encountered by road authorities nationwide. I know that many have had difficulty in understanding why road officials have been somewhat reluctant to modify longstanding policy to more readily permit fiberoptic cable in our freeways. Perhaps the above discussion will help in this understanding and provide a framework for policy changes where warranted as well as a program to address the broader issues of highway/utility joint use in the future.

This paper was presented at "The High Way for Fiber Optics: Corridors of Opportunity" conference, November 1988, Lexington, Kentucky.