STATE TECHNICAL ASSISTANCE IN LOCAL COMMUNITY TRAFFIC IMPROVEMENT PROJECTS

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INTRODUCTION

Today the demands placed on any state transportation or highway agency to provide technical assistance to local communities require very flexible approaches to problem solving. The Ohio Department of Transportation is no exception and as a result we find a much greater need to assure that technical proficiency is maintained within our technical staff, particularly in the rapidly changing technology areas of sophisticated traffic signal and freeway traffic surveillance and control systems.

The necessary shift of emphasis toward making more efficient use of existing highways and streets and away from constructing new highways provides a great opportunity for the transportation and traffic engineering profession. At the same time it also places a great burden on the state to develop and maintain highly efficient methods of providing responses to inquiries, reviewing and processing technical reports and construction plans, and being receptive to local community preferences in types of systems or improvements that are needed.

Although our Traffic Control Section of the Ohio DOT Bureau of Design Services is involved with freeway type systems improvement projects, I will direct my remarks primarily to the application of traffic engineering and signal design improvements to local road and street systems, which I hope will more directly address the typical applications you have here in the state of Indiana.

DEFINING THE PROBLEM

Today all government agencies must carefully consider the expenditure of funds and each purpose intended. When studying the need for a more efficient traffic signal system, for example, it is important that all possible alternatives be considered in the interest of arriving at the alternative that is the most cost-effective solution to the problem. If a computerized system is involved, alternatives must cover goals and methods including data analysis, communication, maintainability, costs, and adaptability of each alternative considered. This is the basic intent of Federal Highway Program Manual, Volume 6, Chapter 8, Section 3, Subsection 4, (1) when federal funds are involved.

One alternative that is frequently overlooked is what would happen to the network of streets under consideration if nothing is done to improve the existing system. This may seem very basic, but the fact is that many proposed improvement analyses overlook this important element in the preliminary study phase.

The alternative of evaluating the existing system should be considered using statistical *parameters that can be measured* such as capacity, level of service, safety (accident rates), travel time and delay, operating speeds, and also *those factors that can't be directly measured* such as public relations. Projecting the parameters comparatively *for all alternate systems proposals* (including "do nothing") will result in a fairly concise conclusion of the best alternative to pursue in the interest of efficient dollar investments.

In the process of considering alternatives, another that is sometimes overlooked is the possible implementation of a non-computerized system that may not be the alternative selected, but is still valid to consider. The statement is occasionally offered that "it is obvious to any engineer that a better system is necessary." However, this statement has no basis without a traffic engineering analysis to support it. Perhaps a current adaptation of a famous question is appropriate to ask when we consider alternatives—"It is not what you can do for the system, but what can the system do for you?" In smaller communities, we have found that a central computer may not be the most practical solution, because of highly technical staff and operational demands on the local agency.

In connection with evaluation of alternatives it is also important to determine the measures of effectiveness that can be used in order to enable the collection of essential "before" data for valuation of the system subsequent to the operation phase. Failure to thoroughly investigate these factors at the preliminary stage preclude summarizing the

good "before and after" study to determine effectiveness of the new system. Measurable benefits also become an excellnt public relations tool for local administrative leaders and the public to understand.

PURSUING THE PROPOSED SYSTEM

Other Systems Affected

In today's "systems" conscious society and the age of computers there is a need to realize that there are other systems usually affected or that may become an integral part of a proposed traffic surveillance and control system. ome of those that typically come to mind are utilities, roadway lighting, other signals (freeway ramp metering), motorist aid, and directional signing systems (freeways).

Design decisions must be made that consider and perhaps incorporate into the proposed system an existing system that could be adversely affected. For example, in the traffic diversion system on Interstate 75 in Cincinnati it was deemed desirable to integrate the directional signing system and a proposed changeable message sign system in order to minimize safety hazards on the freeway, yet retain equal prominence for both systems involved.

Today it is also necessary to consider the inter-dependency of systems prior to implementation. A more recent example that has been expressed by several engineers is the effect of freeway traffic surveillance and control systems on city street systems and the probable need to interface street system computers with the freeway computer systems for ramp metering, to achieve a combined and balanced overall system.

These two examples, although primarily freeway applications, are mentioned to emphasize the importance of time saving that can be attained early in development of a project by carefully considering the impact of proposed systems on other adjacent existing systems.

Agencies and Personnel Involved

Another important item to consider is the total number of agencies affected either in the design of a proposed system or the *operation and maintenance of the system.* No attempt will be made herein to elaborate on this particular item in detail. However, early in the planning stage the following questions should be answered with necessary input received or agreements worked out:

1. *Who* will operate and maintain the system?
2. *How* will the system be operated and maintained?
   a. By local agency personnel
   b. By contract

3. Are competent computer personnel now employed by the operating agency to assist in design and facilitate transition into the operational phase?
4. Is legislation needed between local or state agencies?
5. Has management budgeted for the cost of staffing, operating, and maintaining the system?

DESIGN CONSIDERATIONS

System Elements

In selecting control center accommodations, two basic questions to be resolved early are the location and space needs for the control center and whether it will be used (1) for a short term, or (2) long term period with possible expansion of the control center with future system expansion. Multiple use of space and/or the computer (for other than system needs) also can create funding complications for original procurement of both items, if there are other administrative uses for the computer.

It is very essential to reach an early agreement by all agencies on the goals and methods of the system to be used. As an example in the signal systems area, a number of control strategies are available and should be considered. Applicability of the federally promoted UTCS program with available software should be considered because this program has been designed at considerable expense as the system preferred by the Federal Highway Administration.

Communication system alternatives include, but are not necessarily limited to, direct communication lines, leased telephone lines, radio, and others. The system chosen may vary depending on the local environment and reliability for various alternatives. Leased telephone lines may involve low capital cost, but the long term rates for operation may vary depending on agreements with the telephone company.

Another item that involves careful study during design is the initial service and maintenance of the computer system and desired contractor/supplier obligations. The contractor/supplier should be responsible for servicing the system for a reasonable period to permit time for training of personnel prior to take-over and operation of the system. One item relative to computer maintenance that bears consideration and possible budget planning is an awareness that the normal industry maintenance contract involves a typical computer contract maintenance cost of from ½ to 1 percent per month of the original computer hardware purchase price, or perhaps more. This item becomes important when considering ongoing operating costs of the system.

Method of Installation

Once design development of the system is in process a determination should be made as to the method of implementation: that is "How will the system be purchased and installed?" Normal methods that have been employed are:

(1) Competitive bid contract
(2) Purchase contract for separate installation
(3) Force account (purchase and installation by the local agency)
(4) Combinations of 1 through 3

Almost all of the above methods have been used in Ohio, with the contract bid method being the traditional type utilized by the Ohio Department of Transportation. The special nature of computerized traffic surveillance and control systems requires very careful consideration when Methods 2 through 4 are utilized, because of the interrelationships of the various phases of the work and coordination of time constraints involved with the different agencies performing each item of work.

Because of the limited number of computer suppliers that may satisfy specific needs of the system, a decision to prequalify the acceptable systems was made for systems to be installed for the larger cities of Baltimore and Chicago. This method requires considerable time in preparation and analysis but has proven successful, based on comments offered by city of Baltimore representatives.

It is recommended that optional methods of installation carefully consider the time element of installation of the various components, if they are not all combined into a single project for furnishing and installation of the system (Method 1.)

It is frequently desirable for large systems to separate the computer and its major components into different implementation phases in order to better control the product selection when taking bids. However, once the decision is made to separate any elements of the project system, very careful coordination of the work by each installation agency is necessary to assure that timing, scheduling, and legal conflicts are not introduced. Liability on the part of each agency involved is the uppermost concern to assure that the system is complete at the required date scheduled for an operational system.

Based on observations of several systems being installed in various locations throughout the country, it appears that computerized traffic control systems and local conditions are individually unique, and that relatively few systems will be installed by the same method.

Contract Plans and Specifications

One significant factor in preparing plans and specifications is the desirability to specify equivalent alternate materials, where possible. It facilitates the contractor's scheduling and assured timing of delivery. Occasionally where a local agency prefers a single brand of equipment, other than the computer, we have found in Ohio that the use of alternate bids is helpful to comply with these requests. If the proprietary brand is bid high, the local agency has the option to pay the difference for the equipment, but agrees to in writing prior to award of the contract.

In the past many local traffic operations agencies were accustomed to purchasing materials for traffic control device improvements and installing devices with their own field crews or forces. However, with the increased availability of federal funds for operational improvements, many agencies are now more familiar with procedures for preparing contract plans for competitive bid contracts. However, some local agencies in Ohio with competent technical personnel prefer to perform their own work on a force account basis.

In preparation of contract plans and bid items, we have found the following basic questions generally apply and should be considered by the designer of a system, to clearly define basic items of work in order to assure that contractors can understand the exact intent of the plans and the scope of work:

1. *What* specific work is required?
2. *How* is the work to be performed?
3. Specifically *where* is the work to be done? If these questions are answered each time an item of contract work is specified in the plans, it will minimize the chance of ambiguous intent or overlapping items of work.

Under basis of payment for the various items of work we generally have found the "unit price" method preferable in Ohio, in lieu of "lump sum," because of ease in making and documenting changes and costs. Certain items, however, do not lend themselves to unit prices, and lump sum is sometimes advantageous. Careful study should be exercised in making the determination of which method to utilize.

OTHER CONSIDERATIONS

Length of Construction Period

One factor that also deserves consideration is the length of time allocated to the construction phase of the project. This is also true of items of work implemented by a purchase contract.

In the past it has normally been considered ample to allow a 12 calendar month construction period for the most complex traffic control device project. The special nature of computer type projects indicate that a *minimum* of 18 to 24 months is more suitable to permit an adequate amount of time for purchase, installation, and testing of the system. The contract can be further extended if the contractor is expected to maintain the system for a period of time after it becomes operational.

Construction Inspection

For complex computerized system projects it takes special technical personnel to supervise construction inspection. Prior to completion of the design phase it is highly desirable to contact the construction administration agency involved to determine specific personnel needs for this phase.

In one city project, for example, The Ohio Department of Transportation Field District Construction Office approved the use of city personnel for the construction engineering and inspection, when the technical and inspection capability was available within the local agency.

SUMMARY

Today we find the need to be very flexible in satisfying demands for technical assistance and services provided to our local communities. Although the items discussed within this paper deal with more sophisticated computer project applications, most general principles presented may be applied to other necessary traffic improvements within these same local agencies. We make a concerted effort to be recepitive to new ideas and ways of implementing improvements on local roads and street networks, in order to make efficient use of available funds. In addition high priority must be given to conserving fuel and energy, while at the same time improving air quality in the urban areas. Traffic improvements to local roads and streets have demonstrated the ability to positively impact these major concerns.

There are no simple problems or solutions in this time of high inflation and rapidly advancing technology. However, when everyone and all affected agencies involved cooperate, and *keep one other primary goal in mind, that of improving human mobility and safety,* it is possible to quickly implement transportation improvement projects.

REFERENCE

1. U. S. Department of Transportation, Federal Highway Administration, Washington, D.C., Transmittal 73, dated September 27, 1974.