

## Traffic Engineering Functions in the State Government

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Traffic Engineering has a very unique position in the highway development process. It represents the functional design of highways and all of their elements. It is the tool for the design of roadways, freeways, traffic interchanges, intersections, traffic signalization in concert with the roadway intersection geometry, so they provide adequate travel service to a specific vehicular travel demand and effective traffic flow.

Traffic Engineering is the discipline, which can be the most effective in maximizing the return on the highway development and the highway construction investments. It can predetermine the successful operation of the traffic flow over the constructed highway when the project is constructed. It is the most powerful tool to use in the service to public.

This is the most fundamental definition of traffic engineering, which should be widely known. Sadly enough it is not. It is the highway development and highway operations discipline, which is very much neglected and disrespected in the process.

And that is the reason why I prepared this presentation. It was the beginning of the 1970's, when the Polytechnic Institute of Brooklyn created the very first Planning and Engineering Master Program, where the fundamentals of Traffic Engineering were published and taught from the draft of the "Traffic Engineering" textbook. It was a very impressive program for me to learn the traffic engineering theory in a great detail and apply it first in Stamford, Connecticut in early 1970's. However, it was a frightening discovery that my superiors did not have any notion what it is all about. The history repeated itself in Fairfax County, Virginia, where I became the very first County Traffic Engineer in the year 1975.

In the 1981 I was hired by the Arizona Transportation Research Center, located at the Arizona State University. My task was to develop and manage the traffic

engineering and highway development program, which was federally funded. The very first week of my endeavor I came to another shocking discovery about the traffic engineering at the State of Arizona. There was absolutely no need to perform any research, which I came to administer at that time, rather to implement the very fundamental aspects of Traffic Engineering. The traffic engineering research studies, which were successfully completed and provide good bases for traffic operations issues, such as “Design of Left Turn Signalization”, “Driver’s Behavior at Signalized Intersections”, Design of Traffic Signal Clearance Interval”, and others, one time part of the Traffic Engineering Library ended up in a garbage can, since that was something we do not get into.

The traffic engineering was represented by the use of the Manual on Uniform Traffic Control Devices, which was being used for the development of the striping plans, design of signs, and the work zone traffic control plans. This was being done as the last step in the highway development, as well the reconstruction and maintenance of highways. The main purpose of the traffic engineering was totally unknown and non-existent.

This was the situation more than 30 years ago. Guess what, this is just about the same level of traffic engineering today. The highway development process has been always driven by the available federal funding to be spent on time so we do not lose it. “Nationally, the traffic engineers are the last in the design development process.” This is one of the statements made by the only real traffic engineer at the Arizona Department of Transportation, who held the State Traffic Engineering position for a short time in the year of 1987. “Late in the design process, we are handed a set of construction documents and asked to review or develop maintenance of traffic plan.”

Consistent with my views, the State Traffic Engineer, Ben Burritt, who I am talking about further stated: “Functional design must precede the construction design! In very few progressive organizations, the traffic engineer establishes the design parameters and turns them over to the design engineer to translate the functional design into the engineered design. Unfortunately, this is the exception rather than the rule and explains why intersections don’t work, interchanges

delay, parking lot confuse, shopping centers are miserable to access, parking garages bewilder, etc., etc, etc.”

His final statement in the same letter says: “Early input from the traffic engineer is extremely cost-effective, and in my judgment, far exceeds the benefits associated with the much touted “value engineering”, --again, a design/build fascination.” I will add to it:

Properly executed traffic engineering is the best way to evaluate the transportation alternatives, since it takes into the account the users cost that is never part of the ADOT value engineering process.

Traffic engineering has, therefore, the leading role in the design, development, any changes, and the operations of highways, intersections, and all of the other roadway elements. As such, it has the most effective role in determination of the scope of any highway construction project. It should be absolutely clear, that the traffic operations design comes first prior to the Project Assessment document. It determines what is to be built, modified, or reconstructed in order to derive desired outcome of the construction, which is the effective traffic flow. All of the other highway development disciplines have to support and facilitate the traffic operations design, and never compromise it.

There is also a growing concern about the alternative transportation systems. The reasons seem to vary over the time and include reduction of ever growing highway travel, saving energy, development of economic transportation systems for low income groups, or simply development of well coordinated multimodal transportation system. This adds an entire huge number of issues related to traffic engineering designs. This kind of relationships is even more neglected or totally non-existent in many parts of this country, certainly in this state.

The Traffic Operations Engineering as well as the Transit Operations Design and Management have the leading role in what can provide well functioning transportation systems. That is where the center of transportation leadership needs to be and it is not. Without that, there are many wrong projects being built with limited or no benefits at all to serve the growing travel demand. Worst of all,

many, really many projects represent a huge waste of funding, because there was no functional study and design first.

It seems nearly impossible to convince someone that the key leaders of the state transportation agencies, just like those of the counties and cities, need to be professionals specifically trained in these disciplines at graduate transportation programs. There is no real substitution by civil engineering, business administration graduates, or even worse by mining engineering. Where to obtain such training is another painful subject. There are a very limited number of really good traffic engineering programs available in this nation. There are literally no credible training and transit operations design programs at all.

Instead, we are constantly coming up by new programs such as TOPICS (Traffic Operations Program to Improve Capacity and Safety) in early 1970's, Travel Demand Traffic Signal Responsive systems also as early in 1970's, growing number of traffic signal simulation and coordination programs, Traffic Adaptive Signal system, Traffic Signal Priority system, Total Street system, Traffic Calming, Traffic Diet, and lately the idea of reversing the freeway lanes into bicycle and pedestrian paths, self-driving vehicles, medians with light rail and BRT system, HOV lanes with not more than 5 bus runs in each direction a day, HOV exclusive freeway-to-freeway ramps never carrying any mass transit vehicle at all, or never used \$12 million bus stop in I-10 tunnel for the past 18 years. We also spend billions and billions of dollars, on the Intelligent Transportation Systems, such as changeable message signs to provide messages that the sign is being tested, or to call the 511 number for traffic information. The latest frightening proposal is the Managed Lanes (rather the already mismanaged HOV lanes), which will get its users to pay again for what they already paid for before. And finally the ridiculous idea of rising new funding by changing the public users by the miles had driven.

We do not need more and more funding to be totally wasted on inadequate transportation project design. There is a better way.

My suggestion, get to the basics. We do not need 1000+ pages of Highway Capacity Manual, updated every few years, we do not need new and new traffic

signal manuals, which are often just poor re-writes of what was already available to us 40 years ago.

We need to gather the available limited expertise in traffic engineering and start development of really credible graduate programs teaching the fundamental traffic engineering theory, transportation planning functions, and most of all the transit operations design based on expertise of those who have the real world experience in these issues. In the case of transit, my repeated suggestion is to learn from the European transit systems design, which I have talked about at the Western District ITE Conference in Anchorage, Alaska in 2011 and other places before.

We need the leaders of the transportation agencies to hire these professionals based on the qualification and real world experience rather than based on anything else, like people skills or based on answering some magic interview questions by the hiring team composed of people who have no capacity to judge the traffic engineering profession.

The transportation system, at least in the Phoenix area, is faced with growing bottlenecks, totally wasteful transit system in the most part, and no coordination of the highway traffic demand and the potential transit demand.

The Arizona State Transportation Board just approved \$88 billion, 25-year strategic multimodal transportation plan. There is no strategy how to deal with the growing transportation demand, there is nothing about mass transit at all. This transportation construction plan would not stand the scrutiny of traffic engineering. Many of the projects would not be built at all, others, mainly the construction of new freeways are always being severely under designed. This is the reason, why we have our current freeway system looking like a parking lot every morning and the afternoon.

It is time to start being serious about the really comprehensive transportation study, resulting into a design of effective transportation system, well coordinated between highway and potential transit demand. Only then you can come up with a proper proposed strategic transportation construction plan that will really

provide satisfactory highway and mass transit system to be constructed. Such an approach is never used.

This is just a kind of executive summary of issues related to the traffic operations and design management in the state governments. That is why the mastering these subjects need an entire person as the Traffic Engineering professional, who is well rounded to other related aspects of the transportation systems design, such as the transit operations design, transportation planning capable of making competent proposals in division of the highway and potential transit trips, understanding the capacities of individual transportation modes and their unique operational characteristics.

Properly performed traffic engineering design is directly related to the traffic operations safety on our highways. Therefore, the lack of traffic engineering design often leads to accidents resulting in injuries; loss of life, as well as to physical damages.

There are too many issues that cannot be discussed in any such presentation as I wish I could go through during my limited time in here. That just suggests that the traffic engineering discipline is a complex profession that needs a lot more attention that it is given so far.

I am increasingly uncomfortable listening to all of the government officials, mayors, directors of ADOT, senators, of even the Secretaries of Transportation when they are talking about the transportation infrastructure and the lack of the funding. These people clearly demonstrate that they do not understand that is not only the available funding and construction of transportation facilities that matter. It is because they have no recognition of the need for the functional design of entire transportation systems before the funding and construction is applied to these projects.

The problem is that a US Secretary of Transportation can be a person with the background in public administration, or a high school teacher with experience in vehicle registrations. Transportation Planning Director can be a PhD in political

science, and the State Traffic Engineer educated in mining engineering with self-proclaimed people skills, or currently a former highway maintenance engineer.

It is my moral obligation to keep exposing these issues because the transportation is too important to be left in the hands of politicians. Finally, I feel for a great period of time that the Institute of Transportation Engineers is not doing its job in changing the serious state of affairs.